

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK
BRANCH OFFICES AT 375 OLD COLONY BUILDING, CHICAGO, AND QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON

EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

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VOL. XLIV., No. 18.

FRIDAY, MAY 1, 1908.

THE MOVEMENT FOR HIGHER FREIGHT RATES.

In the aftermath of so-called hard times which follow a financial panic the rule and law of recovery is expressed curtly by the single word "contraction." There is contraction of the price of securities, contraction in the rate of wages and contraction in the cost of living. From the low and solid level thus resulting new prosperity is built up with greater or less speed. Low securities sooner or later induce buying of them. Low wages reduce the price of commodities and when they are low enough demand once again sets in. When demand sets in trade grows brisk, the commodities bought reach the railroads and pass over them, earnings increase and hard times shift into good times. Such is the sequence of events and the normal law of recuperation from panics in this and every other country. It may almost be called a historical as well as logical axiom. Here and there in the past one may find a modifying fact. In 1873, for instance, the recovery in this country was undoubtedly much delayed because gold imports could not be used for the relief of a market not then on a specie basis. But, in general, and up to our present depression the rule stated of relief of financial distress has held.

But in the panic and hard times of 1907-8 we are fronting certain new and strange conditions. For the first time three novel and unprecedented resistive forces are setting themselves athwart the law of healthy reaction from hard times. Organized labor, notably in the case of the railroads, refuses to accept reductions of wages—and does so with some strength in its plea that it faces cost of living reduced very slightly and, in many leading items, not at all. Labor even takes the short-sighted view that it will accept reduced hours and the privations of idleness rather than a lower wage-rate. Next we have the organized trusts, in tacit if not formal agreement not to lower prices and accepting smaller sales rather than lower the profit percentage—their position in the matter thus being strikingly similar to that of organized labor. Finally, on what seems the political motive, we have federal authority throwing all its influence against wage reduction and threatening investigation of alleged railroad "misconduct" if the distressed railroad corporation cuts down wages.

In the case of the railroads, as in other branches of commercial interest, three artificial influences—organized labor, the trusts and federal policy—have thus been set against natural law. Deprived

of appeal to the normal elements of relief the thing easily foreseen has come to pass and the trunk line presidents have been taking counsel together for a general increase of freight rates. Three anomalies of a situation have thus produced a fourth, that is to say, a proposed rise of rates in a period of industrial depression and of natural drift to a lower scale of prices. The railroads say with a good deal of logical force "we have been deprived of certain regular forms of economy and relief. We must now move in the other line of least resistance and increase rates." The plan has one conspicuous peril. Its ultimate burden rests obviously on the consumer to whom every plus in the algebra of prices is at last charged up. The consumer's other name is the general public, not just now too friendly to the railroad corporations and certain not to be made less hostile by an increase of rates. A step not attended with much, if any, risk in a period of commercial prosperity changes its nature when taken in a period of commercial stress and may afford fresh text for the demagogue and politician against whose frothy, albeit fictitious, rage the cold facts of a situation are apt to be urged in vain. And a presidential campaign is not the time when their voices are hushed.

The policy of raising freight rates under such conditions is one which must be determined by the railroad corporations themselves. A good deal depends, doubtless, on the question of change in industrial conditions and the possibility of an outlet in the direction of reduced wages and cost of material attended, perhaps, with the reduced dividends which tend to diminish the burden by dividing it with the consumer and wage earner. But just now and in the immediate case the thing to be noted is the strange and anomalous economic situation in which three forces are crossing natural law and are compelling the railroads also to cross it. The outcome of the conflict of that law with resistive expedients will be a rich theme when the completed story is written.

METAL AND REINFORCED CONCRETE TIES.

In Europe the metal tie has passed the experimental stage, the principles being generally accepted and only the details remaining to be standardized. Conditions abroad, however, are entirely different from those in this country. We have not yet come to the point where it is immediately necessary to look for a substitute for the wooden tie. Several years ago Mr. Whinery showed that,

on the basis of yearly cost of the original investment, a steel tie good for 25 years' service must not cost originally over \$1.85 to be as economical as an untreated wooden tie costing 62 cents in track and lasting eight years. Similarly, a reinforced concrete tie lasting 14 years must not cost over \$1.05.*

Last year the Maintenance of Way Association's committee on ties made a report covering the use of concrete ties, describing a number of designs and giving results of experiments with them. It did not report on steel ties. The committee called attention to three requisites in the design of either steel or concrete ties: First, an efficient method of fastening the rail to the tie; second, a considerable amount of elasticity in the tie itself; and, finally, satisfactory insulation. Difficulty with insulation occurs in concrete as well as steel ties, as short-circuits occur between the rails and the reinforcement. Fiber insulation wears out and track circuit maintenance becomes expensive. The first two requirements are closely related. There must be a certain amount of give between the rail and the sub-grade. Part of this, with wooden ties, is in the ballast, part in the tie and part in the fastening. This cushioning is necessary for easy riding track and to prevent rail breakage, since the rail must be allowed to take its proper curve or "wave" under load. The amplitude of the wave is $\frac{1}{8}$ in. or more. In spiking a wooden tie, some play results, and the rest of the superstructure also lifts and falls somewhat. In designs of ties other than wood the rail is usually fastened firmly to the tie, and the tie itself is rigid. Dr. Haarmann, in the paper recently published in the *Railroad Gazette*, showed designs of metal ties in use in Germany which have more elasticity. This inverted trough type has, in this country, been found too weak to stand up under the much heavier trains which we use. The National of Mexico has for a long time been using ties of this sort on narrow gage road. The average life is given as 14 years before repairs were necessary. The ties were laid 16 to the rail in burnt volcanic clay ballast, the traffic was not heavy and the speed of trains very slow. Failures were due to breakage under the rail seat where the ties are weakened by cutting and bending up part of the metal to make lugs to hold the keys. The officers of the road recommend a U-bolt instead of the key, which will not remain tight. Rock ballast cannot be used with these ties, as it makes the track too rigid, resulting in frequent rail breakage and also damaging the rolling stock. The National of Mexico has not used any steel ties on standard gage track. A trough design was tried on the Pennsylvania Lines West a few years ago. These were Seltz iron ties, 49 of which were laid in the westbound passenger track of the Pittsburgh, Ft. Wayne & Chicago, near Emsworth, Pa., in October, 1904. Part of them were on a 2 deg. 10 min. curve, and part on tangent, 16 ties being used for each 30-ft. rail. These ties broke under the rail seats, and during 1905 they were removed. The Snyder steel tie is shaped somewhat like an ordinary wooden tie, the inside being filled with a cheap grade of asphaltum containing a large proportion of gravel. The Pennsylvania Lines East have about 3,000 of these in service on unimportant sidings. They seem to be satisfactory, but the company has never felt it wise to put them in main passenger tracks.

The Carnegie tie is the only steel tie which has been made in large numbers in this country. It is an I-beam section $5\frac{1}{2}$ in. high; the top is $4\frac{1}{2}$ in. wide and the base 8 in. wide. Smaller sections are rolled for electric lines and industrial railways. The rail is secured to the tie by two rolled steel clips at each rail seat bolted to the tie with $\frac{3}{4}$ -in. bolts. There are indentations in the base to diminish lateral motion, and in the latest design the base is also crimped to tend to prevent shifting in the direction of traffic on heavy down grades. Up to the end of 1907, 248,914 of these ties had been sold to companies outside of the United States Steel Corporation and 593,550 to the corporation and its constituent companies. The first lot were sold in 1904. The experience of the Bessemer & Lake Erie, controlled by the Steel Corporation, on which a great number of these ties have been laid, seems to show that this design is practicable under very heavy traffic as long as it moves at low speed. Under high speed trains it is criticised for its rigidity and the design of the fastenings, the clips holding the rail so tightly that the wave in the rail under the wheel is resisted. The reaction of the steel tie as it returns to position after the wheel impact is much sharper than the cushioned reaction of a wooden tie; the shock, almost undiminished, is thus transmitted from the tie through the rails to the adjacent ties, resulting in secondary stresses which modify the impact and rail wave stresses at different points. Some of

the roads which have used this tie report as follows: The Buffalo, Rochester & Pittsburgh, in 1906, laid 1,500 in main track at Colden, N. Y., part on tangent and part on a 3-deg. curve, and 1,500 in southbound track near Ridgway, Pa., all on a 2-deg. curve. The track is ballasted with broken stone and slag and is subject to heavy, high-speed traffic. The company has had considerable trouble in keeping the fastenings in proper condition, but little trouble in keeping track in surface and line. The price paid, including clips, etc., was \$2.08 per tie. The Cleveland, Cincinnati, Chicago & St. Louis has had in track, for about a year, 3,000 ties laid on a 30-min. curve. At first the fastenings loosened, but this trouble is decreasing. Some of the bolts were removed and showed but little wear. The maintenance cost, as far as surfacing, has been no more than with wooden ties. The purchase price was \$2.02. The Pittsburgh & Lake Erie also has 3,000 ties in track under 90-lb. rail, 22 ties to the rail. They are laid in the main northbound freight track, subject to low-speed traffic, partly on slight curvature and partly on tangent. The track is on stone ballast. The ties are insulated for track circuit and because of the number of points of insulation there has been some trouble, but not enough to seriously interrupt signal service. The officers of the road believe that by using a heavier rail and more ties to the rail they can be properly insulated and used in fast main track service. The cost, including insulation, was \$2.50. The Pittsburgh, Shawmut & Northern has had 700 in track for about nine months. They are laid in gravel ballast on both curve and tangent under 85-lb. rail, 20 ties to the 33-ft. rail. They are under very heavy traffic at low speed, a 227-ton locomotive running over this track. The opinion of the engineering department of this road is that these ties are satisfactory under the above conditions on tangent and on curves up to possibly 3 or 4 degs., but that on greater curvatures they move laterally through the ballast. On 14-deg. curves some of the bolts have been sheared, but this has not happened on 12-deg. 30-min. curves in spite of the heavy locomotive mentioned. The ties cost, delivered, \$2.16. The Baltimore & Ohio has had 2,860 in main line freight track east of Marriottsville, Md., for over a year. They seem to hold line and surface somewhat better than wooden ties, but the design of the clip and the difficulty of getting good bearing on ballast are objectionable features. The New York Central laid some of these ties in rock ballast on straight and curved track under heavy traffic at high speed, using 18 ties to the rail. They were all removed because they complicated the maintenance of signal track circuits and because so many rails broke on them. The Pennsylvania Lines West laid 500 ties in westbound passenger track near Emsworth in the spring of 1905. About one-fifth were placed on a 2 deg. 10 min. curve, and the rest on tangent. They were laid in stone ballast, 22 ties to a 33-ft., 85-lb. rail, and subject to heavy traffic at high speed. They were removed in July, 1907, because it was reported that they were failing. Investigation showed, however, that, while there was some deterioration, the ties should not have been taken out. The company reports that the ties held the track in good line and surface, and comments on the fact that there was less noise under passenger trains than is the case with wooden ties. The insulation at first was not efficient, but before the ties had been removed this difficulty had been mostly overcome. The ties move more readily through the ballast with the creeping of the rails than do wooden ties, and, also, it was found hard to keep them at right angles to the rail. A serious objection is that when the tie is laid in rock ballast, the stone under the bottom flange becomes pulverized so that mud is formed; this occurs no matter how well the track was ballasted and surfaced in the first place. They cost, complete, \$2.62. The Pennsylvania Lines East had some in service for a little less than a year in about a mile of main passenger and freight track at Mineral Point, Pa. After the derailment of a passenger train at that point last year, all these ties were taken out. A careful investigation indicated that their use was not in any way responsible for the derailment, but the resulting damage was greater than it would have been if wooden ties had been used. These ties were more expensive to maintain than wooden ties, and did not make such an easy riding track. The company believes that if the tie were made somewhat heavier, and a better fastening used, it would give good results.

The Buhrer reinforced concrete tie consists of a piece of 65-lb. scrap rail, laid in concrete shaped somewhat like a wooden tie, with flat bearing on the ballast. From 18 to 20 ties to the rail are used. In June, 1903, 50 were laid on the Lake Shore & Michigan Southern, the Lake Erie & Western and the Chicago & North-Western. These ties are still in track in good condition. In December,

**Railroad Gazette*, November 11, 1904.

1903, 21 ties were laid on the Pittsburgh, Ft. Wayne & Chicago, partly on 2 deg. 10 min. curve and partly on tangent, 16 ties to the 30-ft. rail. They were removed the next month because the concrete broke away from the reinforcement. During the following spring 300 more were put in track at the same place. They began to break soon, and by August of that year 131 of the total 321 had been removed. During the fall 200 more were laid, but they continued to break, and by December, 1906, all had been taken out. In the spring of 1903, 50 were laid in main track near Toledo, Ohio, and 50 more at the same place in April, 1904. These were in stone ballast, 16 ties to the 30-ft., 85-lb. rail, under comparatively light, medium-speed traffic. They were all removed during the latter part of 1905 because they broke. In July, 1903, 550 ties were laid on 9 and 10 deg. curves on the Lake Side & Marble Head. They are subject to heavy traffic, but the speed is not over 30 miles an hour. In 1907, 37 ties were removed because the concrete failed. In September, 1903, 77 were laid by the Ann Arbor Railroad on a 6-deg. curve around which passenger trains run at 60 miles an hour. Of these ties, 10 have been removed because the concrete failed under the inner rail. The rest are in track and in good condition. In July, 1904, 1,000 ties were laid on a 6-deg. curve on the Lake Shore. Of these, three failed and were removed in 1905. The rest were taken out in the summer of 1907 because an electric track circuit was being installed. At the same time that these were laid, 1,000 were installed in the Lake Shore main track at Millsburg, Ind. In 1905, 110 of these failed, and in 1906, 105; the rest were removed in August, 1907, when electric track circuits were installed. In October, 1904, 1,000 ties were laid on the Sandusky Pier branch of the Lake Shore, in a city street. So far there have been no failures. During the same month, 500 were put in the Lake Shore switching leads in the Englewood yards. Of these, 31 have failed and the rest are in good condition. The cause of the above removals was, in general, that the concrete split and crumbled, partly because of defects in the concrete, partly through imperfect reinforcement, and partly because of high speed. It is considered that with proper reinforcement and clean, high-grade material, properly mixed, this tie is satisfactory for slow speed and yard track, and should have a very long life. The scrap rail should have the same scrap value after 20 or 30 years as it had in the beginning. The cost of the tie is 95 cents, plus fastenings and the price put on 180 lbs. of scrap rail.

The Percival reinforced concrete tie is, roughly, a three-sided prism, the rails being laid on one face. The lower edge is comparatively sharp in the middle, but is rounded beneath the rail seat to a shape nearer that of a wooden tie. The depth is about the same throughout its length. The rail rests on an impregnated hard wood block. Threaded sockets of Babbitt metal are cast in the tie to receive screw spikes; no clips are used. The reinforcement consists of three corrugated steel bars in the upper surface of the tie and one at the bottom close to the edge; the bars are bound together with wire. The object of blunting the lower edge under the rail seats is to give the tie more bearing surface on the ballast at these points. The comparatively sharper edge at the middle of the tie does not give such a firm bearing on the ballast, so that (considering the tie as a beam with the pressure on the ballast as its load) there is less bending moment at the middle, at which point concrete ties often crack. This tie costs about \$1.85; the concrete is a 2:2:7 mixture, the aggregate being screened to $\frac{3}{4}$ -in. size. The reinforcement weighs about 25 lbs. In the middle of 1905, 25 ties were laid in main line track of the Galveston, Houston & Henderson, at Galveston, Texas. They were laid in sand ballast and were subject to all the traffic of the road at that point, including switching, but not to high-speed trains. One of these was removed nine months later and showed no signs of deterioration, the spikes and cushions being in good condition. In the fall of 1906, three cars loaded with rails ran off the track, breaking the ends of three ties and badly shattering the centers of one or two. The track remained true to gage, and the ties were not removed at that time. In the spring of 1906 some of these ties were laid in the Florida East Coast Railway's track at St. Augustine, Fla., in coquina, or shell, ballast, but no report has as yet been made on them. In October, 1906, a number were laid in the tracks of the Galveston, Harrisburg & San Antonio at Edgewater, Texas, in Gidden gravel. From six to eight freight trains and four passenger trains a day run over this track, at speeds from 40 to 60 miles an hour. In the following February a freight train was derailed and the cars ran over 50 of these ties, breaking off the ends

of about 25 of them. The track remained true to gage and only three of them were at that time removed. The rest were taken out 11 months later. The spiking was in good condition in spite of the derailment, and the ties were not cracked in the center; they were removed only because of their appearance and because the ends of the reinforcing bars were exposed, and so would ultimately corrode. At the same time that these ties were laid on the Galveston, Harrisburg & San Antonio, some were put in the track of the Pittsburgh & Lake Erie in heavy rock ballast. Two of these cracked in the center, and a rail broke, at a joint, between a concrete tie and a wooden tie.

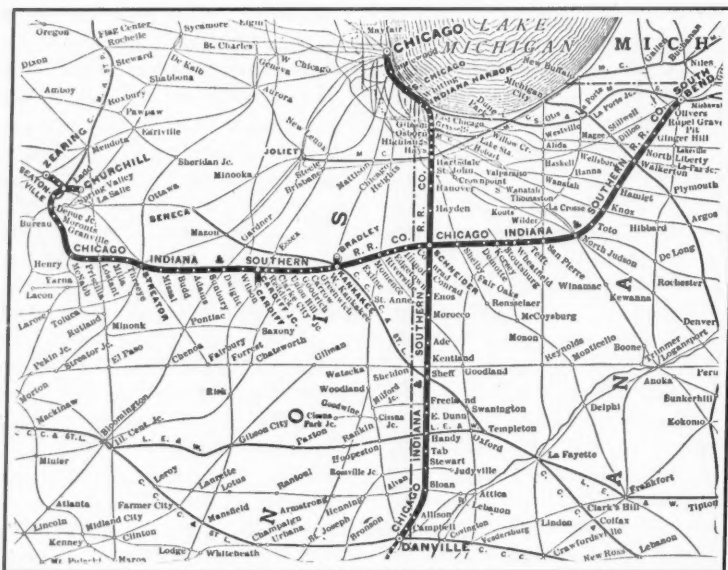
A number of designs of reinforced concrete ties have been tried on the Pennsylvania Lines West in addition to the Buhrer tie. In the summer of 1899, 30 Harrell ties were laid in the westbound main track near Harrison street, Chicago. This tie is about $8\frac{1}{2}$ in. deep throughout; under the rail it is 9 in. wide, and narrows to 5 in. in the center. The reinforcement consists of a steel plate $\frac{1}{4}$ in. by 7 in., set on edge and running the length of the tie, with a number of lugs punched from it to get a grip on the concrete. These ties were put on a 6 deg. 10 min. curve, in stone ballast, 16 ties to the 30-ft., 85-lb. rail, under heavy traffic at high speed. They were all removed within a year because the fastening, a convenient device of spring steel, was too weak. Some of the ties also were badly broken. It does not appear that the design can be used for heavy traffic. The Affleck tie is 8 in. wide and 6 in. deep, with I-beam reinforcement. In the fall of 1904, 100 of them were laid in the westbound passenger track west of Emsworth on tangent, 16 ties to the rail. They began to fail from the beginning, the concrete breaking and crumbling under and outside of the rail. Transverse cracks also developed at the bolts which held the rail clips. By April, 1905, they had all been removed. The Chenoweth tie is 6 in. deep by $8\frac{3}{4}$ in. wide. It is reinforced with six longitudinal $\frac{1}{2}$ -in. bars and with wire netting of $\frac{1}{2}$ -in. mesh. The rail rests on a steel tie plate, between which and the tie is a wooden plate $\frac{7}{8}$ in. thick. The clips are held by screw spikes going entirely through the tie and engaging with a wire helix which is held in a white metal lining fitted in the hole through the concrete. In the fall of 1906, 101 were put in switching tracks in Scully Yard, Pa., on the P., C., C. & St. L. They were placed in cinder ballast, 16 ties to the 30-ft., 85-lb. rail, under heavy traffic at low speed. Up to the middle of January, 1908, four had been removed because they crumbled under the rail. There has been some trouble in keeping the bolts and clips tight. The creeping of the rail tends to turn the clips around, and in a few cases the rail has become unclamped in this way. Each of the three designs described above cost \$1.50. The Keefer tie is reinforced with longitudinal twisted bars. In December, 1905, 44 of them were put in track at the same place as the Chenoweth ties. They began to break soon and were all taken out by June, 1906. On this design the rail rests on oak blocks. These did not hold the spikes firmly and the rails spread. The Bowman tie is 8 in. wide and 6 in. deep, reinforced with expanded metal near the top and on both sides. In December, 1905, five of them were put in freight track at Emsworth, under heavy, high-speed traffic. They all broke under the first train that passed over them. The designer believed that the reinforcement did not extend far enough under the base of the tie, so he furnished 25 improved ties in July, 1907, but they have not yet been put in track.

The Delaware & Hudson laid 99 reinforced concrete ties last fall on tangent in broken stone ballast under 90-lb. rail. Heavy trains are operating over this track at high speed. None of these have as yet been removed. They cost \$1.80 apiece. Several designs of concrete ties have been used on the New York Central in yards, but none of them have been satisfactory. They disintegrate and their rigidity and lack of proper fastenings are also criticized.

The Buhrer cushion and insulation steel tie consists of a steel inverted T section with heavy wooden blocks set on it under the rail seats, the rails being spiked to the blocks in the ordinary way. With this design there is no more trouble with insulation than in an all-wood tie. The blocks are fastened to the steel by bolts passing through metal U straps which pass under the steel beam. This holds the fibers of the wood together and the spikes hold in the wood more solidly than in ordinary wooden ties. They cost, complete, from \$2.25 to \$2.50. The Lake Shore laid a hundred of these in main track at Sandusky Junction, Ohio, in the fall of 1905, and 1,400 more at the same point the following spring. They are laid in gravel ballast on a 1-deg. curve under 80-lb. and 100-lb. rail, 20 ties to the rail. All the westbound traffic of the road goes over this track at high speed. None of the ties have been removed so far.

Chicago, Indiana & Southern.

This company was formed by the consolidation of the Indiana, Illinois & Iowa, known as "the connecting link," with the Indiana Harbor. The Indiana, Illinois & Iowa could transfer through freight from eastern and western roads around the city of Chicago, so avoiding freight delays in Chicago. This road runs from Ladd, Ill., east to South Bend, Ind. The Indiana Harbor line runs from Indiana Harbor, on the lake shore 19 miles east of Chicago, south to Danville, Ill., which is the northern terminus of the Cairo division of the Big Four. It was built by New York Central interests to develop the Cairo division of the Big Four and to enable this division to compete for through traffic between New Orleans, La., and Chicago, and also to open up a new supply of bituminous coal for the



Chicago, Indiana & Southern.

western New York Central Lines. By the new Indiana Harbor-Danville line it is 389 miles from Chicago to Cairo against 365 miles by the Illinois Central. A new fast freight line, called the North & South Despatch, has been established, which handles traffic between Chicago, and New Orleans and Mobile. The Big Four runs through Sheff, Ind., on the Chicago, Indiana & Southern road, to Kankakee, Ill. From Kankakee it at present runs into Chicago over the Illinois Central tracks. It would be possible to run Big Four trains directly into Chicago by using the Chicago, Indiana & Southern's tracks and trackage rights.

The second report of the Chicago, Indiana & Southern, and the first report which shows the combined roads operating as a single property for the entire year, shows gross earnings of \$3,000,000, as compared with \$2,300,000 in 1906, an increase of 29 per cent. Net earnings were \$1,000,000 in 1907 and \$500,000 in 1906, an increase of 100 per cent. Freight earnings were \$2,700,000, an increase of \$600,000. Passenger earnings were \$200,000, an increase of \$32,000, but this increase is not commensurate with the large number of passengers carried, owing to the reduction in passenger rates on intrastate business both in Indiana and in Illinois.

The cost of maintenance of way per mile operated was \$1,300 in 1907 and \$1,000 in 1906. This increase was mainly due to relaying the tracks of the Kankakee division with heavier rails and putting the roadbed in condition for increased traffic.

Freight earnings per mile were \$8,400 in 1907 against \$5,800 in 1906. Freight density was 1,850,000 tons one mile per mile of road in 1907, an increase of 750,000 tons. The trainload was 542 tons in 1907, an increase of 138 tons over 1906. The number of passengers carried one mile per mile of road in 1907 was 31,000, an increase of 6,000 over 1906. Almost all the other operating figures show increased efficiency in handling both freight and passengers.

During the past year the tonnage of bituminous coal carried by the road increased from 960,000 tons to 2,300,000 tons. The total number of tons of freight moved was 5,100,000 in 1907, an increase of 1,100,000 tons over 1906. This is less than the increase in the tonnage of bituminous coal. The only class of freight besides bituminous coal which shows any considerable increase during the year is dressed meats, which increased from 170,000 tons in 1906 to 214,000 tons in 1907.

During the year the company charged \$212,000 for new equipment and \$1,300,000 for new construction and improvements to property, to capital account. New yards, shops and general office buildings at Gibson, Ind., cost \$779,000 and passing sidings and new construction on the Danville division cost \$332,000.

The advantages of the consolidation of the Indiana, Illinois & Iowa and the Indiana Harbor line are shown by the increased traffic

and the increased net earnings. The possibilities of the property seem to be good.

There have been authorized \$20,000,000 fifty-year 4 per cent. bonds, of which \$4,850,000 are reserved for the purpose of paying off the Indiana, Illinois & Iowa first mortgage bonds. Last week J. P. Morgan & Company offered \$15,150,000 of these bonds at 91 and accrued interest. Last year's report showed \$10,000,000 of these bonds outstanding. Besides the interest charge of \$400,000 on these bonds, the company showed a further charge of \$232,700 for interest on loans. These loans are to be paid off. The annual interest on the additional \$5,150,000 will be \$206,000. This is \$26,700 less than the interest charges on the loans. The mortgage securing the bonds is a first lien on all property and equipment of the Chicago, Indiana & Southern, subject only to the underlying bonds of the Indiana, Illinois & Iowa.

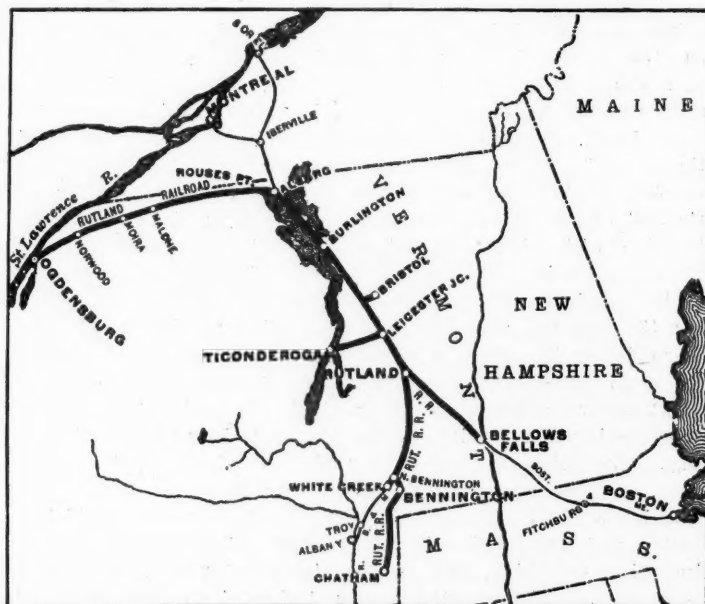
The following table summarizes the results:

	1907.	1906.
Mileage worked	340	340
Passenger earnings	\$206,864	\$174,864
Freight earnings	2,679,876	2,080,406
Gross earnings	3,004,483	2,332,732
Maint. way and structures	443,553	348,596
Maint. of equipment	503,914	348,232
Conducting transportation	873,461	1,023,747
Operating expenses	1,943,130	1,551,808
Net earnings	1,061,353	505,780
Net income	223,180	258,304
Year's surplus	223,180	258,304

Rutland Railroad.

The Rutland Railroad has shown increased cost of operation during the last three years, since the New York Central has been in control, entirely out of proportion to its increase in earnings. The net earnings have increased only 10 per cent. during this period, while the gross earnings have increased 25 per cent. The history of the road explains this. Under the direction of Dr. Seward Webb the Rutland bought control of a number of small roads, and through ownership of the Rutland Transit Company, which operates a line of lake steamers from Ogdensburg, N. Y., to Chicago, was able to establish new through routes between Chicago and Boston. It was not able to compete successfully for through traffic, however, because these routes are neither the shortest nor the cheapest. The New York Central gained control of the Rutland through buying a majority of the preferred stock. It is said that the Central paid \$100 a share, but most unwillingly.

The cost of maintenance of way and structures and maintenance of equipment have steadily increased since the Central took control, and last year maintenance of way per mile of road was \$1,200, against



Rutland Railroad.

\$1,000 in 1906. This is an ample but not at all excessive figure for such a road as the Rutland. About \$40,000 of the sum spent for maintenance of way went toward relaying track with 80-lb. rails. The unit costs of repairs and renewals of equipment for 1907 were \$2,119 per locomotive, against \$1,708 in 1906; \$662 per passenger car in 1907, compared with \$564 in the previous year, and \$51 per freight car in 1907, against \$49 in 1906. These are no more than fair allowances, and they are large increases over the figures of 1904. The number of freight cars decreased by 176 last year, and the total capacity of freight cars was 3,740 tons less in 1907 than in 1906.

The policy of the New York Central has been to charge betterments and improvements to income account. In 1907 \$41,000 was

charged to income for new equipment, and in 1906 \$29,000 for new construction. This policy has reduced the surplus, shown after the 1½ per cent. dividend, from \$149,000 in 1904 to \$7,000 in 1907.

Gross earnings in 1907 were \$6,532 per mile of line operated, an increase of \$624 per mile, while net earnings were \$1,889 per mile of line operated, an increase of only about \$70 per mile. In previous years passenger earnings generally increased more than freight earnings. In 1907, however, freight earnings increased 11 per cent., while passenger earnings increased only 6 per cent. In handling freight the company is making a fair showing. Freight density has increased during the three years from 417,000 to 598,000 tons one mile per mile of road. The revenue trainload increased last year from 223 to 248 tons. The average haul has increased from 95 to 108 miles. The tonnage of nearly all classes of freight increased in 1907. Bituminous coal showed an increase of 69,000 tons over 1906, but even with this increase it was less in 1907 than in 1904. The tonnage of grain increased 70,000 during the three years. The tonnage of stone, sand, etc., decreased materially in 1907.

The preferred stock of the Rutland is a 7 per cent. cumulative stock on which there is now due 171½ per cent. During the past year the minority stockholders called a meeting to protest against the policy of the directors, which charges additions and betterments to income. The proposal was made that common stock be issued to preferred stockholders to the extent of 25 per cent. of the profit and loss credit balance (which was \$924,200 on December 31, 1907) and the dividend on the preferred stock be reduced to 5 per cent., the New York Central to guarantee this 5 per cent. No definite arrangements were made, but the proposal that the New York Central should guarantee anything on Rutland stock was laughed at by the railroad officers. The minority stockholders protested that the Rutland was being managed for the benefit of the New York Central system and not for its own best interests.

The principal statistics of operation, rearranged according to our usual classification, are as follows:

	1907.	1906.
*Mileage worked	415	415
Passenger earnings	\$1,025,846	\$967,298
Freight earnings	1,837,265	1,656,244
Gross earnings	3,058,087	2,799,209
Maint. way and structures	486,754	452,673
Maint. of equipment	428,851	380,640
Conducting transportation	1,167,695	1,027,104
Operating expenses	2,173,978	1,948,199
Net earnings	884,109	851,011
Net income	186,492	179,625
Dividends	135,864	135,864
Year's surplus	50,628	44,761

*There are 53 additional miles operated for passenger trains only.

NEW PUBLICATIONS.

Experimental Electrical Engineering. By V. Karapetoff. New York: John Wiley & Sons. 790 pages, 6 in x 9 in.; 538 illustrations; cloth. Price, \$6.00.

This book is professedly a laboratory manual for testing, adapted to the especial requirements of students in their junior and senior years of such universities as Cornell. It presupposes a certain amount of electrical and physical knowledge on the part of the reader. But, given a familiarity with the basic principles of magnetism and the electric current there is no excuse for any one possessed of a mind of average intelligence not to comprehend every sentence contained within its covers. In his preface the author thanks certain of his associates upon the faculty of Cornell for assistance and moral support in the preparation of this book. If these associates were made familiar with the contents of the manuscript as it progressed, it is small wonder that they gave generous encouragement towards its completion, for it is a rare thing to find a writer upon a scientific or technical subject that brings to it such a mastery of the language and such a familiarity with the details coupled with the power to pick out the gist and essence of a subject and then express it in such clear and simple diction as we find in the book under consideration.

While presupposing a familiarity with the fundamentals the writer is never betrayed into an overweening confidence in that familiarity, but with the instincts of a true teacher he bases his work upon the value of line upon line and precept upon precept, advancing gradually and thoroughly until even the most casual and desultory reader would find himself steeped in the subject. And yet there are no vain repetitions. The statements are concise, remarkable for their lucidity, for their selection of the gist of the matter, and for discarding all extraneous and non-essential matter.

The book is too big to be covered by a brief review, for it takes in almost the whole wide range of electrical engineering practice as embodied in the measurement of resistances, the construction and operation of electrical instruments, electrostatic capacity, the magnetic circuit, permeability, photometry, illumination, transmission and distribution, generators and motors, transformers, converters, induction motors, windings, batteries, switchboards and controllers, railway work, heating and telephony. But it is noteworthy that the scheme upon which this is worked out is that of a division

into chapters, each of which is complete and independent in itself. The book opens with an introduction intended to illustrate general principles, so that there is at once established a complete understanding between the writer and his reader as to what it is proposed to discuss. Diagrams and other illustrations are profusely used to make all things clear, and a series of experiments that are to be performed by the student in order to test the principles laid down, are included. These experiments increase in complexity and difficulty from the beginning to the end of the chapter, and thus each clusters about its own particular center. Under these circumstances the author recommends that the elementary experiments selected from nearly all the chapters be worked out first by the juniors and that the seniors follow with the others that are more complex. In each case the object of the experiment is stated, and this statement is followed by clear instructions regarding every step that is to be followed, down to the checking and the preparation of the report.

Schematically, the book is devised for student use, but broadly considered it can well find its place on the shelves of every electrical engineer, not only because of its intrinsic value as a comprehensive treatise, but because of the suggestiveness that every practical worker must find within its pages, to say nothing of the pleasure of reading an author who has so thoroughly mastered the art of expressing things.

The Engineering Index Annual for 1907. Published by the Engineering Magazine, Nassau street, New York.

In this volume, as in the Annual for 1906, the *Engineering Magazine* has adhered to the classified system which is followed in the monthly record of technical papers printed in the magazine. The company formerly published a five-year volume, but has found the annual volume more satisfactory from all points of view. The heartiest praise should be given to this kind of work. It cannot be an important source of profit to the publishers, but it presents an extremely valuable record for the engineer engaged in research work or desirous of obtaining all the detailed information which has recently been published about some branch of his profession.

CONTRIBUTIONS

Steam Shovel Performance.

Ottawa, Ont., April 27, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have noted the item about steam shovel performance in your issue of April 24, and was somewhat startled at Mr. Colvin's figures, until I saw that his day consisted of the full 24 hours, or two shifts of 10 hours each. I have been so long of the opinion that we held the world's champion record for small steam shovel performances that it never occurred to me we might have to defend it.

Our record was made while building the O. A. & P. S. Railway, now a portion of the Grand Trunk Railway System, and I submit the figures for one month in the summer of 1895, in sand and small gravel pit at M. P. 146.

Shovel used, Marion, Style A-1 yard dipper, served by two trains of 12 cars each. Haul, one-quarter mile to five miles. Work, filling trestles and raising dump. During 26 days of 11 hours shovel loaded a total of 65,000 yards, or an average of 2,500 yards per day. The best day's work was 3,070. To do this 307 34-ft. platform cars were put past shovel. The haul for this day was 1,000 ft. only, but I claim the world's record for this day with small shovel and platform cars.

The pit was a long one with good face, and the shovel was moved twice only in month. But the bank was not all good, and cemented sand had to be poled and blown down, while there was a spur of rock in middle of cut that gave considerable trouble. Work was in charge of Joseph Leslie, Roadmaster, and shovel was handled by George Holtby, both of Ottawa. Records kept by

E. J. McVEIGH,
Storekeeper, Grand Trunk Ry.

How Can We Get Better Conductors and Enginemen?

McCook, Neb., April 24, 1908.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Much interest is being manifested of late on the subject of railroad accidents, and while the consensus of opinion seems to be that inattention to duty and violation of rules are the prime causes, and the remedy strict discipline and the enforcement of rules, few practical theories are advanced as to the best way to secure the desired results.

The rules of the operating department are safe and cover the ground so that with sufficient thoroughness very few accidents would occur; and there are only two factors to be taken into consideration to secure the proper observance of rules, namely:

to secure officials who are strict enough disciplinarians to enforce the rules impartially upon all, and to secure a class of men who can be made to realize that not only do the tenure of their positions and perhaps their personal liberty, but also their lives and the lives of others depend upon their strict observance of rules. It is not always possible to secure officials who are able to withstand the pressure brought upon them by the intercession of grievance committees and personal friends, and it is practically impossible to make the average man submit to discipline in the proper spirit.

It seems to me that the thing to do is to have a law passed by Congress empowering the Interstate Commerce Commission to appoint in each state a commission composed of trained experts in the railroad business, preferably one or more train despatchers, conductors and engineers, a part of whose duties shall consist in passing upon the competency of all employees who have charge of handling trains in interstate traffic. Or, this commission might be appointed by the state railroad commissions. Require each conductor, despatcher and engineer to pass an examination before this commission and to secure a certificate of efficiency before being allowed to take charge of a train; and to be re-examined every three or four years. Require each railroad corporation to include in their reports to the commission covering train accidents the past records of those employees who may have been concerned in the accident, in order that they may be in a position to determine what, if any, bearing the actions of the employee in the past may have on the question at issue. . . . Empower this commission to call before it for investigation any or all employees of the railroad corporation who may be concerned in an accident, which in the opinion of the commission is serious enough to call for investigation, and give the commission power to annul, upon sufficient assurance of guilt, the permits of any conductor, engineer or despatcher. . . . A marine engineer or the master of a ship must secure a license before being permitted to act in their respective positions. The stationary engineer is required to secure a license in most states. The dentist has to pass a rigid examination before he is allowed to pull your tooth. Is it out of reason that the man at the throttle or at the key, who has your life in his charge, shall be any more exempt from proving his competency than the doctor or the dentist?

The examinations that the railroads require their employees to pass are not rigid enough. In theory they are, but not always in fact. Too often the element of personality enters into the examination and men are allowed to pass because they were good brakemen or good firemen, and the examining official trusts, because of this fact, that they will succeed in the more responsible position. Too often the official who is conducting the examination is not a practical man in the handling of trains, so far as the outside work is concerned, and for this reason is handicapped when dealing with the many little things that come up in the daily life of a trainman or engineman which make for success or failure in those positions. Too often men are allowed to pass upon the request of someone with a pull, or upon the behest of a brotherhood.

The railroads should conduct an examination of their own, but the examination before the commission should be supplemental and serve as a check upon that given by the railroad company.

A better grade of men would be attracted to the train service on account of the greater immunity from danger guaranteed by having a more careful set of men. The necessity of reporting the past record of employees who are concerned in accidents will be a check upon the official with respect to his retaining in the service any employee whose past record stamps him as a dangerous or an undesirable man.

M. H. LEARNARD.

[We are glad to print Mr. Learnard's letter, not only because he has a right to be heard, but also because his views are shared, no doubt, by many other thoughtful railroad men. The letter speaks not only for the writer but also for many others who have not put their ideas on paper. But we must remind our correspondent that the main feature of his proposal, licensing men by the federal or state government, is a remedy which very likely would prove to be worse than the disease. The first essential in an examining board is integrity—high personal character. Add to this the necessary experience, judicial temperament and ability to issue decisions that would stand the fierce criticism that they would be subjected to, and you have a set of requirements that no political appointing power would measure up to, one time in fifty. Even if the appointing of examiners could by some good fortune be kept free from the influence of unworthy political motives, the limitations of salary which the lawmakers would impose, with the obvious limitations of human nature, which, as we can see all around us, keep the standard of ability low in public offices of all kinds, constitute such serious obstacles that any hope of effecting material improvement of the personnel of the train service by state examinations would be small indeed. Admitting that the government does do some good in its activities concerning doctors and steam-

boat captains, the present proposition is a doubtful one. Improving conductors' and enginemen's consciences is an intricate problem.—EDITOR.]

What Are We Going to Do About Accidents?

TO THE EDITOR OF THE RAILROAD GAZETTE:

"Faith without works is dead." A few months ago the *Railroad Gazette* contained an article signed by W. L. Park, and only a few weeks ago one signed Vice-President which contain an ample number of practical suggestions to about do away with those accidents which are due to failure to respect rules, if only they were carried out. Mr. Park is a stickler for drill and inculcation of safe habits. This position is taken, not, as I have heard him remark, because he deems it absolutely necessary for an engineman to actually stop every time he explodes a torpedo on straight track in broad daylight; but, to insure that he will do so when the conditions are not so favorable, Mr. Park insists that such signal should be respected. His reason for this is obviously so sound that the same principle should be applied to all rules which are necessary to enable trains to be handled safely.

"Vice-President" says: "Appoint one or more experienced railroad men as inspectors (not detectives), who shall report to the General Manager. Require inspectors to note not only how the men obey, or disobey the rules, but how officials enforce and understand the rules." This reminds us that not only must Mr. Park's rule be carried out; in addition we must show the rank and file wherein they have failed, and must instruct officers as may be necessary concerning matters which may not be known to them, owing to their having multitudinous duties. Officers should avoid formalities, writing up only such cases as may be needed for record, or to use as examples to assist in preventing others from committing the same errors. Treat all information furnished you by employees as strictly confidential, and decline to reveal the identity of the persons who help out by giving you pointers. I have read somewhere that "all intelligent people soon grow restive over too much and too many reminders of their being subject to discipline." Some other bright man remarked that "any old scheme will figure out all right on paper." I believe these "saws" to be correct in the main, and that better results would obtain were men talked with more and shown their erroneous reasoning or conclusions instead of being reported and suspended. I do not mean, however, that men who habitually sleep on duty, or indulge in intoxicants or narcotics, should not be disciplined. I would fire that gang bodily before they got a chance to make a mistake, and perhaps kill worthy employees.

I believe it is an economical investment to have a competent inspector of transportation and plenty of trainmasters; but how can the economy be proved? Possibly the problem for the general manager to solve is how to scrape up enough money to pay the men now on the rolls. While I have no doubt each such employee would effect a saving of fully \$5,000 a year in accidents, overtime, etc., I cannot prove it, and am therefore left without anything tangible upon which to base an appeal. In some instances the employment of an additional set of despatchers on a crowded division would no doubt effect a saving in the overtime account much greater than their salaries would amount to, and would increase the mileage of engines; but, again, we are confronted with the same declaration, "prove it."

Too much attention is given to deep, intricate train-order problems and too little to such so-called unimportant matters as enforcement of signal rules and such others as prescribe clearance, protection, taking siding at initial switch, keeping away from switches while they are being used by trains, calling fixed signals, reading train orders, turning switch to run the inferior train in on siding at meeting points, drunkenness and sleeping on engines and in cabooses.

In nearly every investigation of accidents which I have taken part in trainmen state that they had not forgotten the meeting order; that they were just getting ready to take the necessary steps to prevent the collision when it occurred. Perhaps if such men were touched up to the extent of from \$20 to \$50 for not acting they would remember to do so next time.

On many roads enginemen are allowed to whistle about as they please—may whistle out flagmen, or not, just as they think best; may acknowledge a signal to start a freight train by two short blasts, instead of two medium long, and if they happen to fail to whistle for a station nothing is done about it. Failure to whistle for a station may mislead the men in the caboose and at least give them an opportunity to escape punishment (if an accident occurs) by claiming that they had lost their bearings. I think rules should forbid a freight train from going through a station without receiving a proceed signal from the rear. If signaled to proceed, engineman should answer by two medium long blasts. If the engineman knows that he must stop to meet a train, or can get no farther to clear a superior train, he should, after whistling for the station and waiting about two seconds, sound three short blasts. Under such an arrangement a failure to whistle, or to receive a proceed signal,

would cause others interested to believe that something was wrong, or had been forgotten, and there would still be time to take the necessary steps to prevent a collision. The objection to allowing enginemen to sound two short blasts to start is that that signal is also an answer to a hand-stop signal given by a flagman, and it often has caused confusion and accidents. Perhaps it would not be a bad idea to alter the code rule to conform to the above suggestions. Rule 14 (b) could easily be changed to read: "Release brakes. Answer to a signal to start, or to indicate ready to start."

H. W. FORMAN.*

American Railway Association.

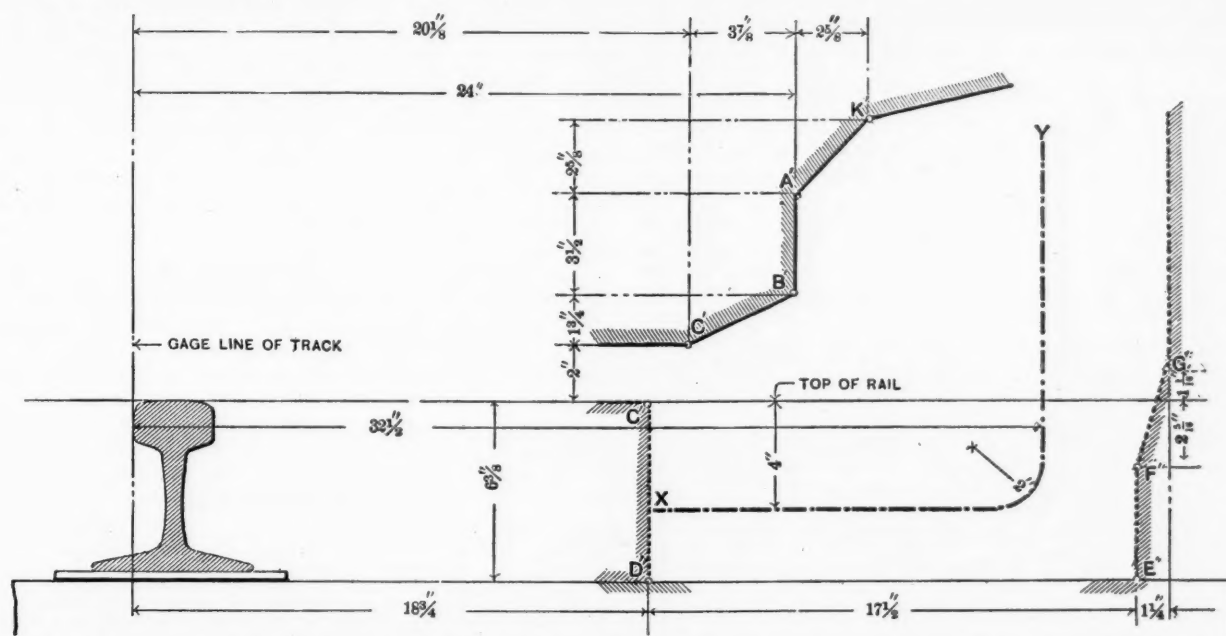
The spring session of the American Railway Association was held at the Hotel Belmont, New York City, April 22. There were present 225 delegates, representing 150 members. The Executive Committee reported that the membership of the association now comprises 338 members, operating 240,770 miles; and the associate membership 44 members, operating 1,630 miles.

A special Commission on Interchange of Freight Cars has been appointed by the Executive Committee, consisting of James McCrea (Pennsylvania), Lucius Tuttle (Boston & Maine), W. W. Finley (Southern), Howard Elliott (Northern Pacific). A report was presented by a sub-committee of the Executive Committee on the subject of bringing into relation with the American Railway Association the various voluntary associations of railroad officials. It is desired to harmonize the work and increase the usefulness of these other organizations, and the committees of the American

of "renewals" as required by the Interstate Commerce Commission is at best a guess. The determination of a measure of depreciation must of necessity be based upon average life, which is impossible of accurate or even approximate determination. The relation between the equipment retired in past years and that in existence to-day, or that may be subsequently acquired, is too vague and too indefinite to admit of the application of the law of averages for the determination of measures of charges to operating expenses in anticipation of future requirements.

The committee approves the classification of operating expense accounts as promulgated by the Interstate Commerce Commission, with the following exceptions: The text for "loss and damage, freight" should read "including company's material." The text for the several renewal and depreciation accounts applicable to equipment should be abrogated and appropriate texts inserted under "replacement." There should be a provision for revenues from outside operations, so that the revenues from the operation of water lines, etc., may be included in the gross revenue of the company; and the committee recommends a separate primary account for this purpose.

On the subject of depreciation of equipment the committee does not approve the rule promulgated by the Interstate Commerce Commission; but it recognizes the fact that while that rule is in effect it is necessary for the depreciation charge to be made. If that rule be continued this committee recommends that, by reason of the fact that there is and will be under any rule of depreciation a duplicate charge made to operating expenses, railroad companies be permitted to charge against the depreciation reserve a proportion of the cost of repairs to equipment. The committee further recommends, if



Recommended Clearances for Rolling Equipment and Structures; American Railway Association.

Railway Association will be rearranged so as to provide for supervision when desirable and for facilitating co-operation.

A resolution was adopted requesting the Master Car Builders' Association to harmonize the terms used in designating different classes of cars and different kinds of cars in each class, according to their physical characteristics, and to report to the association.

Certain amendments to the Articles of Organization and By-Laws were adopted, including one changing the dates of meeting from April and October to May and November.

The Committee on Car Service submitted a decision in connection with Car Service Rule 10, which was approved, as were amendments to Car Service Rules 10 and 11, and Per Diem Rule 7.

The Arbitration Committee reported decisions rendered in connection with Arbitration Cases Nos. 37, 38, 39 and 40.

The Committee on Safety Appliances submitted a Code of Air-Brake and Train Air Signal Rules, which was adopted and made part of the Standard Code of the association.

The Committee on Accounting and Statistical Inquiry submitted a proposed classification of revenue and expense accounts, which was referred to the Executive Committee.

This committee recommends that the adoption of a system of physical statistics should be deferred, as the Interstate Commerce Commission intends to promulgate a system of classification of accounts to take effect July 1 of this year. The committee believes that the depreciation of the property may be fully covered by charges to operating expenses through the medium of "repairs," as directed by the Interstate Commerce Commission, and through "replacement." The application of measures of "depreciation" and

*Author of "Rights of Trains on Single Track."

the depreciation rule is to be continued, the elimination of the accounts, equipment borrowed, debtor and equipment loaned, creditor, for the reason that through the medium of these accounts arbitrary charges and credits to operating expenses are made which are not justified. The net debit or credit through these two accounts is too small to justify the expense of keeping the accounts.

The Committee on Car Efficiency reported that its work in collecting and publishing statistics had been continued. There has been a more general compliance with the requests of the Committee for information, but there is still opportunity for improvement, especially in the line of promptness. The reports now regularly cover about 160 roads, including practically all the more important ones.

The reports concerning car shortages and surpluses have excited a general interest through the country, indicating as they do the present unfortunate railroad situation in a striking and concrete way. The figures showing the surplus cars have been widely reprinted, not only in the periodical press, but in government publications. It is pleasant to record the fact that the surplus has decreased since its high-water mark on February 5, but, unfortunately, this decrease appears to be largely influenced by arrangements which have been made to hold large numbers of cars under load, which possibly should be counted as surplus.

Progress is being made in the more equal enforcement of car demurrage through the country, which will undoubtedly have a favorable effect on car efficiency, when business again increases. The committee has maintained relations with various government commissions, national and state, and has collected considerable information in regard to railroad legislation. The committees formed

to supervise demurrage on coal at tidewater and on the lakes have continued their meetings and somewhat broadened their scope, and a committee is considering demurrage on and storage of export freight at the principal Atlantic ports. Meetings have also been held at certain points to determine proper switching reclaims.

Owing to the desirability of economy the work of the committee has been cut down to its lowest basis, and since the shortage of cars disappeared most of the railroads which were interested in the record feature of the Clearing House have discontinued this work which was done at their expense.

The clearing feature, however, under which Per Diem and mileage balances between railroads are handled, has shown a gradual and gratifying increase, and there are now 10 railroads using it in clearing their car service balances. This work is done at cost to the subscribers, and it is found that this cost is so inconsiderable that the plan has advantages both of convenience and economy. The committee will be glad to see further growth in this direction.

The Code of Car Demurrage Rules, which was adopted at the last meeting of the American Railway Association, has been under consideration by most of the Car Service Associations in different parts of the country. Some of the associations have already adopted, almost in their entirety, the rules as recommended, with exceptions to suit local conditions. Many of the associations have adopted the suggestion made to change their designation from "Car Service Association" to "Car Demurrage Bureau" or "Demurrage Bureau."

The committee has on file at its Chicago office the rules of all the Car Service Associations and Demurrage Bureaus in the United States, as well as those included in state laws and promulgated by state commissions. The committee also is collecting the Car Demurrage Rules of the railroads which have recently dropped out of Car Demurrage Bureaus. It is, therefore, ready to give full information in regard to the Car Demurrage situation throughout the country.

The matter of storage is still having the attention of the committee. Wherever storage is handled by car demurrage bureaus by the transportation departments of railroads and in accord with state laws or state commission rulings, the committee endeavors to keep itself fully informed on the subject.

The rules on export freight at the different Atlantic seaboard points are still unsatisfactory, but gratifying progress is being made toward harmonizing them. The rules governing bituminous coal at tidewater points have, at some points, been extended to cover anthracite coal, and these rules are working very satisfactorily, the equipment being released much more promptly than formerly. The rules which were in effect on bituminous coal transshipped by lake have now been in effect for a season, and results have proved them to be extremely beneficial. A new set of rules, including certain amendments, has been formulated to cover the current year.

In the last report mention was made of the great decrease in the delay to cars on account of the rule adopted by the Trunk Line Freight Association and the Central Traffic Association, imposing a charge for reconsignment. Since that time, the Western Trunk Line Association has adopted a rule in regard to a charge for reconsignment more stringent than the rule of the eastern roads. This has caused great relief in the yards, particularly at large centers, and in the coal traffic; one road reporting the saving of four switching engines at one point from this cause.

Your committee is endeavoring to keep in close touch with all national legislation and has made arrangements to be furnished with all bills introduced into Congress in any way affecting railroad interests. The progress of these bills is being closely watched. A synopsis of these bills is made and copies can be procured from the Secretary of the association at a nominal charge. Your committee is also endeavoring to keep in close touch with the Railroad Commissioners of the different states, and has been in active correspondence with them.

On the Pacific coast the free time for unloading freight cars has been reduced to 48 hours on all articles except lumber, on which 72 hours is allowed.

The Committee on Transportation of Explosives urged all members to become members of the Bureau of Explosives. The membership of the bureau now comprises 94 companies, operating 149,669 miles of road. The committee submitted a revision of the Regulations for the Transportation of Explosives, and a set of Regulations for the Transportation of Inflammable Articles and Acids, both of which were adopted by the association.

The Committee on Standard Location for Third Rail Working Conductors has issued a circular giving suggested clearance diagrams for third rail working conductors, and the association adopted the following resolutions: (1) That the diagrams showing lines of clearance as presented in the report be approved and made the standard of the association. * * * (2) That in designs of new rolling equipment which is to be used in interchange, the clearance line K'A'B'C', including such horizontal and vertical variations which may in any reasonable probability occur in combination at one time, should not be exceeded. In determining this, the position of the equipment on a 20-deg. curve should be con-

sidered, making allowance for the side-throw of the bolster and the consequent effect on the location of such portions of the equipment that are attached to the car body. Variations in equipment should be allowed for as follows: Horizontal, $2\frac{1}{2}$ in. in all; vertical, 4 in. in all. (3) That in design of new bridges, trestles, tunnels and platforms, no part that is continuous for more than 7 ft. should come within the space for third-rail structures,† and should preferably clear this line by at least 1 in., as is shown by the line C", D", E", F", G", but that structures which are not continuous for more than 7 ft. may be allowed to come to the line XY.

The report of the Rail Committee will be found under another head.

F. A. Delano, President of the Wabash, was elected President, and W. A. Gardner, Vice-President of the Chicago & North-western, was elected Second Vice-President of the association for the ensuing year.

The association decided to hold its next session at Chicago November 18.

Report on Standard Rails.

At the meeting of the American Railway Association in New York City April 22 the Committee on Standard Rail and Wheel Sections submitted a complete report including a series of rail sections of two types, and specifications for Bessemer and Open Hearth steel rails, which were adopted by the association as recommended practice. On the recommendation of the committee, the association adopted resolutions providing that gage of track be measured between the heads of rails, at right angles thereto, at a point $\frac{1}{2}$ in. below the top of the rail; and that the standard distance between the main rail and guard rail and in the throat of all frogs be $1\frac{1}{4}$ in., measured at the gage line, for all tracks of standard gage. A resolution was also adopted by the association, providing that the two types of section and the specifications for the standard rail be referred to the American Railway Engineering and Maintenance of Way Association, with the request that that association study the question of drop tests, observe and record behavior of rails of the proposed sections, compare results from the two sections and submit to the American Railway Association a single standard for adoption.

The standard sections now adopted by the association are the same as those (Type A and Type B) recommended by the committee last October, and shown in the *Railroad Gazette* of Nov. 22, 1907, page 627. The specifications differ from those before reported (*Railroad Gazette*, Dec. 20, 1907) in the clauses covering discard and chemistry. These clauses, as now reported, are:

There shall be sheared from the end of the bloom formed from the top of the ingot, sufficient "discard" to insure sound rails. (All metal from the top of the ingot, whether cut from the bloom or the rail, is the "top discard.") The chemical composition of the steel shall be within the following limits:

	Bessemer Steel Rails.				
	60 lbs.	70 lbs.	80 lbs.	90 lbs.	100 lbs.
Carbon	0.37 to 0.47	0.40 to 0.50	0.43 to 0.53	0.45 to 0.55	0.46 to 0.56
Manganese	0.80 " 1.10	0.80 " 1.10	0.80 " 1.10	0.85 " 1.15	0.90 " 1.20
Silicon	0.10 " 0.20	0.10 " 0.20	0.10 " 0.20	0.10 " 0.20	0.10 " 0.20
Phosphorus*	0.10	0.10	0.10	0.10	0.10
Sulphur*	0.075	0.075	0.075	0.075	0.075

(When lower phosphorus can be secured, a proper proportionate increase in carbon should be made.)

	Open-Hearth Steel Rails.				
	60 lbs.	70 lbs.	80 lbs.	90 lbs.	100 lbs.
Carbon	0.50 to 0.60	0.55 to 0.65	0.60 to 0.70	0.65 to 0.75	0.70 to 0.80
Manganese	0.75 " 1.00	0.75 " 1.00	0.75 " 1.00	0.75 " 1.00	0.75 " 1.00
Silicon	0.10 " 0.20	0.10 " 0.20	0.10 " 0.20	0.10 " 0.20	0.10 " 0.20
Phosphorus*	0.04	0.04	0.04	0.04	0.04
Sulphur*	0.06	0.06	0.06	0.06	0.06

(When higher phosphorus is used, a proper proportionate reduction in carbon should be made.)

*Not to exceed.

All rails are to be branded with the name of the maker, the weight of the rail, and the month and year; and the number of the heat and a letter indicating the portion of the ingot from which the rail was made, shall be plainly stamped on the web of each rail, where it will not be covered by the splice bars. Rails to be lettered consecutively "A," "B," "C," etc., the rail from the top of the ingot being "A." In case of a top discard of 20 or more per cent., letter "A" will be omitted. All rails marked "A" shall be kept separate and be shipped in separate cars. All open hearth rails shall be marked o H; and the specifications for open hearth stipulate that the manufacturer shall, before the rails are shipped, furnish the inspector with a complete chemical determination for each heat.

In its report the committee says:

With regard to the discard question, the committee has always held that it would be preferable to test the finished product rather than specify as to details of mill manufacture, and the committee arranged for a trial lot of rails to be rolled from the ingot without any discard whatever except such as was necessary to enable the

†This space was indicated in diagrams showing the practice of the New York Central, the West Jersey & Seashore and the Long Island, printed, with the Committee's previous report, in the *Railroad Gazette* of Nov. 8, 1907, p. 559.

bloom to enter the rolls, and after these rails had been cut into small pieces, they were broken under the hammer and the fracture examined. This test proved to the satisfaction of the committee that if "pipes" or other physical defects were present they could be detected by this means. The test also proved quite conclusively that it is possible to so conduct the process of manufacture that the "pipes" or other physical defects will be reduced to a minimum, and that these defects may not occur at all, even in rails rolled from the top portion of the ingot.

In order to avoid an unnecessary waste of good material, the committee set about to devise means by which the rejection of defective material could be insured without requiring an arbitrary and definite percentage of discard in every case, and a committee of the Pennsylvania Railroad pursuing the same line of investigation, adopted a tentative specification which provided for a physical test of this nature, and which further provided that when physical defects were discovered, all top rails of the heat should be rejected. * * * A trial lot of rails, of a section corresponding to "Type B" submitted with the committee's report of last October, was recently rolled under this specification as to discard, and the results convinced the committee that a development of this idea would prove the best solution of the discard problem.

Some of the advocates of a fixed and arbitrary discard have argued that the mere provision of a discard to insure the elimination of "piped" rails, or rails containing physical defects, was not sufficient, and urged the rejection of a fixed percentage from the top of the ingot, because of the well known fact that segregation occurs in the upper portion. This question of segregation was given careful consideration by the committee, and while it is a fact that, due to the rearrangement of the constituent parts of the metal during the process of cooling and solidifying in the ingot mold, an analysis of the metal in the finished rail will often show a wide departure from the analysis required by the specifications, it is also true that an analysis of the metal taken from the different parts of the finished rail will frequently show similar wide variation. This discrepancy is due to the fact that the test ingot referred to in the specifications, and upon which the chemistry specification is based, is taken from the ladle before the metal is poured into the ingot mold, and consequently before the segregation takes place.

It has been assumed that, because of this variation from the standard composition of the metal in the finished rail, the rejection of all segregated metal would be warranted. But, on this assumption, it would be necessary to discard more than a third of the upper part of the ingot to be on the safe side, as the segregation frequently extends that far, and while our knowledge of the subject is not as complete as we could wish it to be, we have a great deal of evidence that rails of good physical condition can be made from the upper portion of the ingot.

Furthermore, the analyses of a large number of rails taken after years of service indicate that these wide variations in chemical composition may occur without apparently affecting the safety or wearing quality of the rail, and since it is impossible to check the analysis of the finished rail with that of the test ingot, the question arises as to what limits should be placed on the variation which will be permissible. None of the experts consulted are ready to say what this limit should be, and all admit that no facts are available as the result of actual experience which would warrant the adoption of any fixed limit to govern the rejection of material. The provision in the new specifications for stamping the rails to show their position in the ingot will enable us to obtain more definite information on this point in the future.

The committee conferred with a number of disinterested experts on both the discard and phosphorus questions, and among the principal authorities consulted were William Metcalf, of Pittsburgh; Robert Forsyth, of Chicago, and Professor Henry M. Howe, of Columbia University. These gentlemen all agreed that it would be preferable to test the finished product rather than specify a fixed percentage of discard, and they also agreed that it would be unreasonable to require less than .10 phosphorus in a specification for Bessemer rails intended to cover purchases for all American railroads.

In the matter of rail sections, the committee, after considering criticisms and suggestions, and after visiting the mills and witnessing the rolling of rails of both the new types of section, are confirmed in their opinion that a change from the A. S. C. E. section is necessary in order to obtain the best results in manufacture. * * * So far as stability is concerned the recommended sections are well within the limits of safety, and with respect to the cutting of the ties it was felt that the increasing wheel loads of modern traffic necessitate the use of tie plates on curves and on soft wood ties in any event.

* * * Recently some important lines have shown a disposition to drop the 85-lb. standard; but as the committee has again been urgently importuned by the manufacturers to hold the railroads in line on this matter, in order to prevent the multiplication of sections, your committee has determined to hold to its original recommendation (five weights), and trusts that the members will

see the importance of subordinating personal preferences to the general good.

The committee feels that the main objects of the investigation have been accomplished, and that members are now in a position to secure the best rails which can be manufactured in the present state of the art. The adoption of the new and better balanced sections will enable the manufacturers to roll the rails at lower temperatures, thus ensuring a finer grain and better wearing quality, as well as reducing the internal stresses. The nearest approach to a single standard type has been arrived at consistent with present engineering knowledge and opinion. Provision has been made for the rejection of all rails containing dangerous physical defects, and means have been provided for keeping accurate records of the rails rolled from different parts of the ingot, and for uniform reports of rail failures, so that accurate information as to the cause of failure will be available in the future.

It will be noted that no reference is made in the specifications submitted, to the deflection under drop test, as definite figures can only be inserted after the new sections have been actually rolled and tested. * * * The committee has recommended the adoption of a new standard type of anvil which is very much heavier than those used heretofore, and a further revision of the drop test specification may be found necessary after observing the results of a sufficient number of tests under the conditions resulting from this change. * * *

In connection with the investigation of the cause of the excessive wear of rails in the London "tubes" since the installation of electric traction, certain experiments have been made in England, both on electric and steam lines, with the high-silicon rails advocated by Mr. C. Peter Sandberg. The results of these experiments seems to be quite favorable, and the subject should be followed up by the Committee of the American Railway Engineering and Maintenance of Way Association.

The experiments with canted rails, referred to in the report of April, 1907, have not been carried on long enough to enable your committee to arrive at any definite conclusion, but a recent inspection of these experimental rails indicates that the canting will cause a tendency to tighten up the gage, and it is also observed that on curves the metal of the top of the head "flows" to the inside of the low rail, instead of to the outside as in usual practice. This latter tendency will have to be reckoned with in considering the effect on flange wear.

Colonel Yorke on the Shrewsbury Derailment.

The British Board of Trade has issued its report, prepared by Lieut. Col. H. A. Yorke, on the disastrous derailment which occurred at Shrewsbury, Oct. 15, 1907, when 11 passengers and seven trainmen and mail clerks were killed. In this case, as in the Salisbury and Grantham accidents, the train was derailed by running at high speed through a curve at which safety required very low speed. The accident occurred on a Tuesday at 2:08 a. m., and the engineer, 52 years old, had been in the service of the company 37 years, and an engineman 10 years. He was not a teetotaler, but was described as a sober man. The record showed 13 entries against him: four for running past stations at which he was booked to stop, two for passing signals at danger, five for being absent without leave, two for losing time or allowing his engine to emit clouds of black smoke at a station. All these faults occurred between the years 1896 and 1905. After an exhaustive study, Colonel Yorke holds it extremely improbable that the disaster was due to any defect in the engine or the roadway, and he believes that the engineman had fallen asleep. The runner had been on duty all of Sunday night and from 8:15 p. m. on Monday; and though he had been in bed on Monday, the inspector could find no satisfactory evidence as to how much he slept. The inspector finds that the fireman, who had had to attend actively to his fire, probably was not asleep (although he may have been so) but was unaware that the engineman was not wide awake. The fireman was 22 years younger than the engineman. The engineman and fireman were both killed. The body of the engineman was examined by a government physician and no traces of alcohol or malt liquor were found in the stomach.

Having found sleepiness as the most probable cause of this disaster, Colonel Yorke goes on to consider possible remedies. First, he suggests that the duties of drivers and firemen should be so arranged that they shall not be on duty during the whole of two consecutive nights. The proposal to have three men on the engine is condemned, but speed recorders are favored, although no such apparatus would have done any good in this case. Colonel Yorke hears that the French government is going to make the use of speed recorders compulsory. The report discusses cab signals and automatic stops, but the inspector contents himself with saying that the question of their desirability is not yet settled. "Pending the introduction of cab signals, or automatic train stops," Colonel Yorke recommends that the signal which was overrun in this case be moved back about 1,500 ft. (the block section is very short), and that signal boxes on descending grades approaching junctions or

important stations be equipped with apparatus by which the signalman could put a torpedo on the track. Many signal boxes now have apparatus of this kind, but it is not used except in times of fog or falling snow.

As it is always difficult to get reliable testimony as to whether brakes have been tested when trains are made up, Colonel Yorke suggests that the testing should be witnessed by the station master in every case, who should sign a certificate, to be given to the man in charge of the train. It is also suggested that when enginemen sign for important notices or other documents their signatures should be witnessed, not by an engine wiper, as is the general practice, but by a responsible officer.

Westinghouse Horizontal Double-Acting Gas Engine.

The type of large gas engine described herewith is the result of about ten years' development of various sizes and types at East Pittsburgh. During this time orders for 1,054 engines have been taken, averaging a little over 140 h.p. Some of those now in operation are used for 25-cycle single-phase interurban railways, 60-cycle central stations, 25-cycle and 40-cycle industrial plants, all operating in electrical parallel, and there are also many direct-current plants.

While most of the engines are running on natural gas, the largest plants use some form of manufactured gas. By-product coke oven gas promises an excellent field for development, although little has been done as yet. Pooled coke oven gas averages above 50 per cent. hydrogen and often reaches 66 per cent. By-products from the stills in oil refineries consist almost entirely of

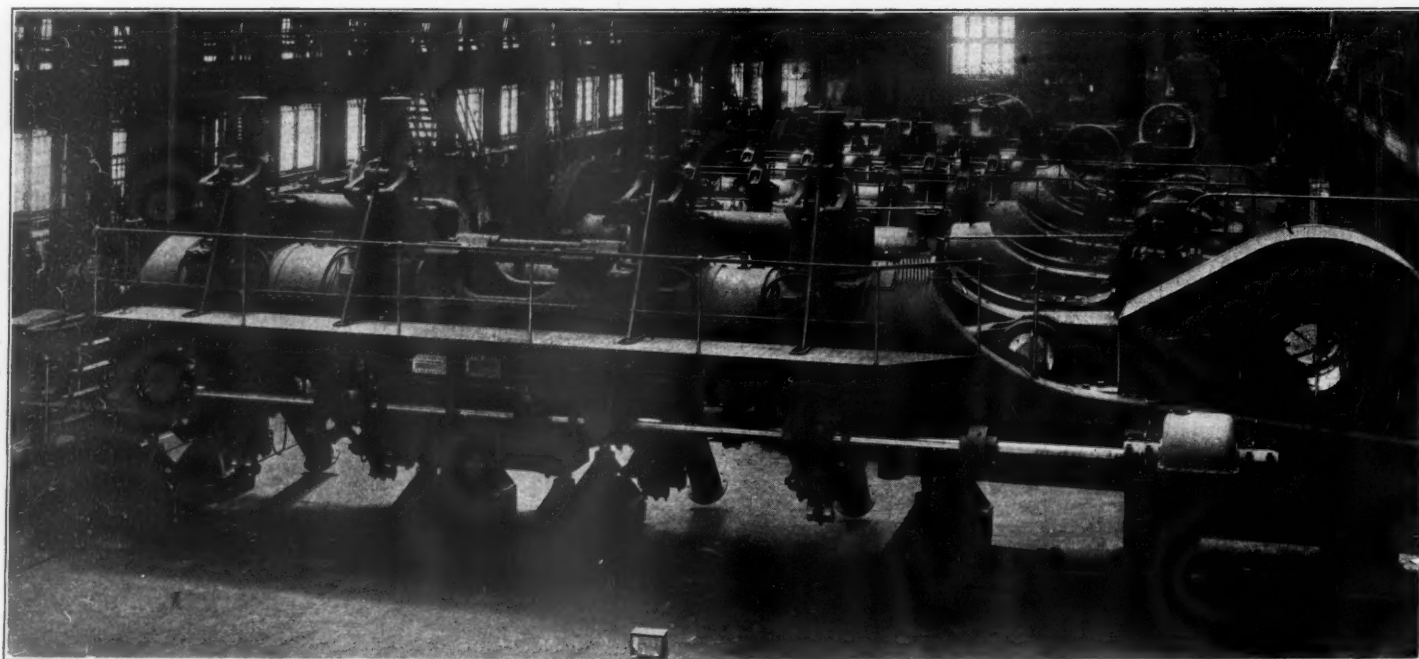
months shows actual operation 93.2 per cent. for the horizontals and 97 per cent. for the verticals.

The Westinghouse engines are four-cycle and the tandem cylinder arrangement is standard for all sizes, whether single or double crank. The former gives two power strokes per revolution, the latter four power strokes per revolution, with cranks at 90 deg. A solid concrete block extends the full length of the housing and some feet in front, but a clear space is left between the piers to allow access to the exhaust valves. By removing the inlet valve of a cylinder a man may enter to inspect the cylinder. One piston may be removed through each end of the engine without disturbing the other head or the engine alinement.

The main frame is of heavy box girder construction, with internal ribs to withstand transverse stresses arising from the side-crank construction. The smaller shafts are solid and the larger are bored hollow. On engines under 1,000 h.p. a three-part bearing is used and on larger sizes a four-part bearing.

The cylinders of the small engines are symmetrical, one-piece castings, with openings closed by split jacket bands with joints of flexible packing to allow the cylinders to expand independently of the jackets. The water spaces are easily accessible for cleaning. Cylinders of the large engines are cast in halves to insure sound castings with the best metal where most needed. The cylinder is supported at the ends only, and the weight of the pistons and piston-rods is carried by the front, center and rear crossheads.

The valves are in a vertical line at the center of the cylinder, so that heating and dilution of the incoming mixture is avoided. Exhaust gases discharge straight downward without encountering



Westinghouse Horizontal Double-Acting Gas Engine.

the higher hydrocarbon gases, and are extremely rich, even double that of natural gas, 1,200 to 2,000 b.t.u. per cubic foot. For the leaner gases cylinder diameters are slightly increased, as well as compressions. Within the past year very material progress has been made in the application of producer gas to all classes of service, and it is probably true that the future of gas power rests with the corresponding development of the producer.

Parallel operation, except at excessive frequencies, is no longer a difficulty. Although spring couplings are used in the vertical type single-acting engine, they are unnecessary in the horizontal engine, except for special cases. Although a double or triple set of igniters is provided to insure positive ignition, the actual cyclical variation, due to the impressed crank effort, is but a fraction of that allowed in steam practice. In other words, the factor of safety in amplitude of cyclical variation is large enough in Westinghouse engines to provide for the contingency arising in case of displacement of one complete set of igniters. The governing system, as described later, makes accurate speed regulation possible.

Westinghouse gas engines are rated at 10 per cent. below the maximum load that the engine will sustain for a considerable period. Allowance is made for fluctuation in the heat value of gas, so an engine rated on 125 b.t.u. producer gas can sustain full load on gas as low as perhaps 100 b.t.u. A 200 or 300 h.p. engine is nearly as efficient in heat consumption as an engine of 1,000 or more horse-power. The efficiency is largely independent of the kind of gas used, because leaner gases will stand higher compression. A horizontal gas engine can make long, continuous runs. In the mills of the Iola Portland Cement Co. the record of eleven

any pockets for the accumulation of foreign matter. Compression spaces of volumes suitable for the various qualities of gas can be arranged without changing the design of pistons or cylinders or the location of the valves.

The pistons are cast in one piece, symmetrical in design, without internal ribs or sharp corners, and without the use of chaplets or other methods of core support. They are permanently mounted on the rod. Rods are made in two parts so as to be removed through front and rear housing. They are bored hollow for cooling water, except at the center of the piston where the ducts connect. The pistons float free from the cylinder walls, the rods not being cambered but designed stiff enough to support the weight without undue deflection. Pistons are kept tight by sectional rings with keepers and springs. For the rods, sectional metallic packing is used, consisting of a number of segments mounted in series along the rod, with two solid rings next to the cylinder. These segments are supported by springs to relieve the rods of their weight.

Instead of a single governor valve, gas is governed and mixed directly by each inlet valve. Only one eccentric is used to operate both inlet and exhaust valves. In the lay shaft drive, "hunting tooth" gears are used—the intermediate lay shaft running at an odd number of revolutions per minute. This distributes the wear evenly over all the gear teeth. Hollow water-cooled exhaust valves, of either cast iron or steel, are used in all sizes, or a combination valve with cast iron head and steel stem. Stems are lubricated about the middle of the bushing. To remove the valves it is only necessary to drop out the entire cage with the assistance of a rope swing. By means of an oil-pressure relay system the regulator

is entirely relieved of the actual work of moving the heavy valves. The regulator is driven direct from the engine shaft and connected by means of reach rods to the various inlet valves. Oil pressure for the relay is supplied at about 50 lbs. pressure by a small pump driven from the engine lay shaft. If the governor is disabled, a safety device shuts down the engine by cutting off the ignition. A spring-balanced plunger in the rim of the fly wheel is projected by centrifugal force at a predetermined speed, and trips a pawl. In some plants an additional safety stop acts if the water supply to the jacket fails.

Make and break ignition with high voltage and low current furnished by a small motor-generator is used. Cast iron or special bronze points are used on the moving contacts, and the fixed terminals are steel. Both sides of the igniter circuit are insulated, making a double ground necessary to put an igniter out of commission. In the event of a serious ground, the igniter on that circuit is immediately insulated by a fuse blowing out. Igniters can be removed while the engine is in operation by shutting off gas from the cylinder and relieving the compression by blocking open the exhaust valve. There are two or more igniters for each combustion chamber; in the larger sizes there are three, located at corners of an equilateral triangle. These make combustion more rapid and perfect. Two types of gears operate the igniters; the electro-magnetic, and the mechanical cut-off. The former consists of an electro-magnet connected in series with the igniter terminals, and tripping by an S-shaped armature engaging the igniter lug. The

maintain at the inlet valves the proper mixture. This is a butterfly disc valve, the position of which is controlled by a small gasometer connecting with the main on the engine side. The movement of the gasometer and the butterfly follows instantly upon the varying demand for gas by the engine. In some cases it is also desirable to install a receiving tank to further take care of the fluctuation in pressure.

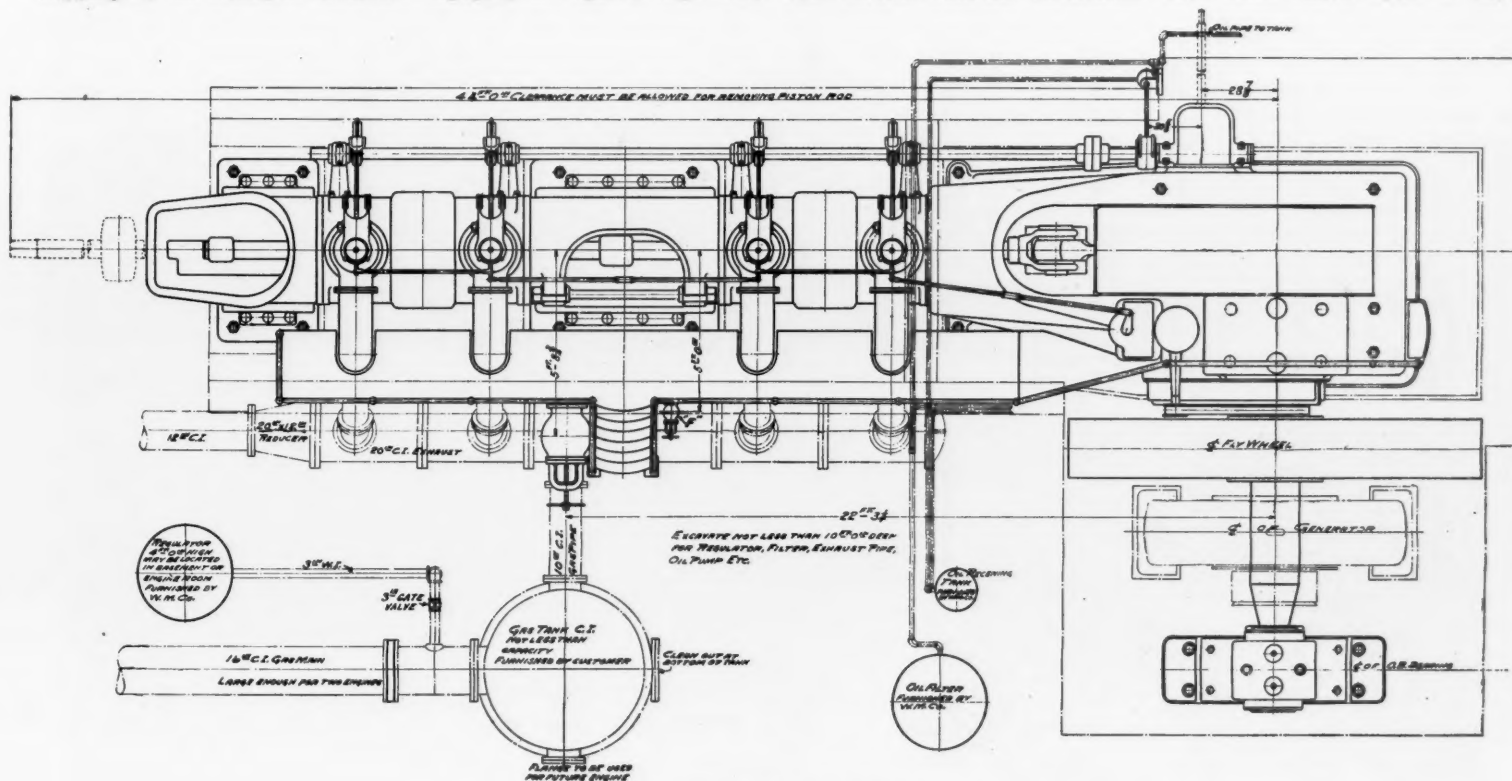
Foreign Railroad Notes.

The Prussian State Railroad authorities direct that those in charge of workshops encourage the participation of apprentices in athletic exercises.

Mr. Zemp, since 1891 at the head of the Railroad Department of the Swiss Federal Council, has been chosen Vice-President of the Confederation for 1908.

The Italian railroads have let a contract for 165 passenger cars, costing more than \$1,300,000, to works in Riga, Russia, which is perhaps the first time that Russia has exported rolling stock.

The Prussian State Railroads some time ago had a number of pressed steel coal cars built to carry 22 tons on four wheels. They had sides 6 ft. high, with two double doors on each side. The several railroad directories have been called upon to say



Westinghouse Gas Engine.

field coils furnish the inductance ordinarily provided by spark coils. The mechanical device carries the usual knock-off cams geared to the lay shaft.

For the cylinders, force-feed lubricators are used. The oil is accurately timed so as to reach the piston just at the close of the power stroke when it is covering the oil ports. In a number of 500-h.p. plants, cylinder oil consumption is as low as from three to five gallons per week, ten-hour day. These lubricators serve cylinders, packing glands, and exhaust valve stems. Engine oil is fed by a gravity system, including pump, filter and elevated reservoir with individual sight-feeds, all controlled by a single valve, so that individual adjustments, once set, need not be changed.

Particular attention has been given to reducing the quantity of water required for the engine. A series system of cooling has been used to some extent. Each cylinder, piston and exhaust valve have separate discharges. Water enters the piston through telescopic connections at the center crosshead, discharging front and rear into chambers cored out of front and rear housing. A water pressure of 25 lbs. is all that is required for supplying all parts, and, in some plants with exceptionally pure water, a 25-ft. static head is sufficient.

The engines are started by compressed air. With ignition on, the engine starts itself after opening compressed air and gas valves. As each cylinder picks up its ignition (after one or two revolutions) the compressed air supply is automatically cut off by a check valve held to its seat by the combustion pressure.

There is an automatic regulator in the gas supply line to

whether more of this kind should be ordered. Most of them say no; the sides are so high that it is difficult to load them where there is no loading machinery, and the coal, etc., is liable to be much broken by falling so far. Moreover, the cars when loaded have so great a weight per wheel that they are not allowed on the Austrian and on some of the Saxon railroads.

The Austrian State Railroads, in view of the high rents in Vienna, have bought a piece of ground near one of the stations and built thereon nine three-story buildings containing in the aggregate 144 tenements, each of two rooms and closet, which are let to trainmen at low rents. The whole cost was \$180,000, which is \$1,250 per tenement. Gardens and playgrounds are attached.

The German engineer Frahm, who was for several years technical attaché of the German embassy in London, in a recent communication says that in England the advocacy of large cars of the American design, carrying 50 tons or so, which was much in evidence some seven years ago, has quite subsided. It came chiefly from men unfamiliar with the practical requirements in England, where the railroad officers themselves had already investigated the subject, and knew what they could do. They are now generally convinced that 20 tons is the limit, but a great many 12 and 15-ton cars have been built.

The Austrian Railroad Ministry has established a sanitary department. It will have charge of the administration of the sanitary

service, will co-operate in determining all questions involving railroad hygiene, such as clothing of employees, provision for their meals when on the road away from home, hours of work and rest, and time of vacations; will criticize from a sanitary point of view all plans of buildings, and will give its opinions on signaling, the furnishing, lighting, heating, cleaning and disinfection of cars, the ventilation of tunnels and of railroad restaurants; and will keep the statistics of sickness and death in the state railroad service.

Bergen Hill Tunnels of the Pennsylvania.

The south tunnel of the two tunnels which the Pennsylvania is driving under Bergen Hill, west from Hoboken, N. J., was driven through on April 11. It is expected that excavation on the other will be finished next month. These tunnels are each 5,920 ft. long; they connect at the Weehawken shaft with the two tubes running under the North river. At this point the floor of the tunnel is about 75 ft. below the surface and about 60 ft. below mean high water. Under the crest of Bergen Hill, the floor is about 220 ft. below the surface. No unusual difficulties have been encountered in the work on these tunnels, but the progress has been slow because about 4,000 ft. had to be cut through Palisade trap rock. This is so hard that steam drills could not drill more than 1 ft. an hour. Work has been under way for about three years. About 260,000 cu. yds. of rock have been taken from the two tunnels, and over 680,000 lbs. of dynamite have been used.

One of the accompanying photographs shows the interior of the tunnel near the Hackensack, or western, portal, and the other shows the portal itself. From this point the tracks are to be carried on trestles and fills across the Jersey meadows to connect with the main line near Harrison.



Tunnel Interior near Hackensack Portal, Showing Use of Cross Section Rod.



Hackensack Portal of Bergen Hill Tunnels, Looking East and Showing Arches of Cut-and-Cover Section; Pennsylvania Railroad.

The Ocean Carrier.

BY J. RUSSELL SMITH, PH.D.

XVII.

Trans-Atlantic Freight Rates and Their Control.—II. The Lines Between America and the Continent.

The independent, competitive and chaotic condition existing among the lines connecting the United Kingdom and the United States is in very marked contrast to the relationship of the Continental-American carriers with each other. There are but two German trans-Atlantic lines of importance—and there is but one interest, the North German Lloyd-Hamburg-American. They represent the culmination of a series of consolidations that ended competition in their respective ports. They never actually wage war on one another, and where their pockets are affected they are astonishingly agile in getting the best results for both, while standing together to prevent encroachment by any new concern. With their close traffic understanding and pooling arrangements, with their alliances with the International Mercantile Marine Company's Red Star Line and the French Line, and with the joint control of the Holland-America Line a remarkable front is presented by these five dominant companies in the continental freight and passenger business.

The Hamburg-American Company alone may really be considered as a vast and strong conference, the only difference being that it is all owned by one firm rather than managed by a conference of owners and its solidity is therefore absolute. It dominates the German and Scandinavian trade with America, having its own lines to all ports of importance from Montreal to Galveston, and transshipping at Hamburg to Baltic and Scandinavian ports. Any small lines that from time to time go to Hamburg do so by its consent. In its earlier days it competed, fought, won and consolidated until at present its competition is well nigh irresistible. The great force of its competition arises from the fact that having 57 services in nearly all parts of the world, it is in the identical position of an American trust which kills a small rival by doing business at a loss in his small territory while it is making profit in the other 95 or 98 per cent. of its own territory, and with this profit can pay dividends and also maintain a strangulation fund.

These two German companies in guarding their territory from competition have not only driven and kept rivals away from their own ports; but, for the last 40 years, the establishment of services to Scandinavia has been regarded as an undue and unpermissible encroachment; because it might carry directly the goods now handled by transshipment through Hamburg and Bremen, especially Hamburg.

The most recent of these episodes is the attempt of a Philadelphia firm to start a line from that city to Copenhagen. As soon as the service was begun they were advised by the Hamburg-American Company representatives to withdraw or take the consequences, and having maintained the service, very severe and damaging competition followed by both lines and by new ones especially created by them for the purpose. The American firm, one of the oldest and most reliable in the business, filed a complaint* before the Interstate Commerce Commission which may be taken as an excellent exhibit of rate and traffic control by an ocean carrier. It states that more than a decade ago the Hamburg Company established such a system of rebates that through its financial penalties * * *

shippers were not permitted to ship goods, whether they were interested directly or indirectly, either as owners of the goods or as agents, except by the lines of the Hamburg-American Packet Company, or by such lines as it might direct. This contract, when made with a German forwarding agent, covered whatever merchandise he might handle for any or all of his foreign or domestic principals, no matter by what route or routes he may have been instructed by the bona fide owners of said merchandise to forward their goods to ultimate destinations in the United States.

In other words, the Hamburg-American Packet Company not only secured the right absolutely to fix freight rates from Hamburg to the United States North Atlantic ports of Boston, New York, Philadelphia, Baltimore, Norfolk, and Newport News, but, in like manner, peremptorily demanded as well the right to name the steamship lines by which the shipper should forward freight from Bremen or Rotterdam to the said United States North Atlantic ports, thereby preventing the shipper from sending his merchandise by any other lines than those specifically designated by the Hamburg-American Packet Company.

If the goods were destined beyond the American seaboard, this arbitrary selection of trans-Atlantic lines frequently involved the determination by the Hamburg-American Packet Company of the United States inland carrier by which the goods should be forwarded from the seaboard to their final destination, and a consequent restraint of trade within the United States.

This rebate contract first issued in 1895 has been withdrawn and a modified form issued. "Under this modified form of contract, the Hamburg-American Packet Company agrees to carry all the goods of the merchant at a certain rate, provided he will ship goods to the six United States North Atlantic ports only by lines of the

Hamburg-American Packet Company, or such other steamship lines as that company may designate."

"This contract covers all shipments that may be routed via German or Dutch ports, the routing of which can in any way be controlled by the merchant. Both the goods of the merchant and those which may be ordered through him or transshipped under his direction are included in the contract. Though the principal may have goods to forward from different ports, the agent must submit to the Hamburg-American Packet Company the determination of the lines by which the goods in question are to be transported from the respective ports. The merchant in an interior distributing center of the United States, ordering goods through his German representative, who is under contract with the Hamburg-American Packet Company, must submit to have all his goods shipped via such lines as the Hamburg-American Packet Company may dictate.

"Thus the Hamburg-American Packet Company not only fixes the rates from Hamburg, but it controls the selection of the steamship lines by which shippers may transport their goods from Bremen and Rotterdam to the United States North Atlantic ports."

"The Hamburg-American Packet Company, after years of aggressive tactics, stands to-day the absolute dictator of the German-American trade. No steamship company in the United States, or elsewhere, dares to question its lofty supremacy; such temerity would be followed immediately by attempted extermination.

"Thus a company, foreign in its control, dictates the rates, the line, the manner, the method, the routes and every other condition of trade and traffic to which the United States producer, manufacturer or shipper must humbly submit if he aspires to introduce his goods to the foreign consumers via the three most northern important Continental ports."

The complaint then goes on to state that in addition to this contract control there is a further dominance through a pooling agreement which the strong hand of Hamburg also controls.

"We desire especially to make complaint against the eastbound or export Baltic pool dominated by the Hamburg-American Packet Company, and maintained and manipulated by them in New York, in conjunction with the North German Lloyd, Scandinavian-American Line and Wilson (Hull) Line. The Baltic pool comprises the eastbound merchandise traffic through the United States North Atlantic ports of Boston, New York, Philadelphia, Baltimore, Norfolk and Newport News destined to ports or places in the kingdoms of Denmark, Sweden and Norway, the province of Finland and the German ports on the Baltic. This pool arbitrarily determines the ultimate rates for forwarding merchandise on through and on local bills of lading from the cities of Chicago, St. Louis, Kansas City, Omaha, Minneapolis, Duluth, Cleveland and other manufacturing centers of the United States via the United States North Atlantic ports, either direct to the Baltic or via Hamburg, Germany; Bremen, Germany, or Hull, England."

The pool divisions were described as follows: "Routes to Baltic direct, and those via other nations, by which Baltic traffic is forced by the pool to travel, and percentages allotted each route:

The Hamburg-American Packet Company, via Germany.....	56 per cent.
The North German Lloyd, via Germany.....	17½ "
The Wilson (Hull) Lines, via England.....	2½ "
	76 per cent.
The Scandinavian-American Line—direct to Denmark	24 "
	100 per cent.

"To make easier and more certain the percentage division of the traffic, the field has been parceled out to members of the pool. The Hamburg-American Packet Company maintains a service to Hamburg from each of the six United States North Atlantic ports of Boston, New York, Philadelphia, Baltimore, Norfolk and Newport News. The North German Lloyd maintains a service to Bremen from New York and from Baltimore. The Scandinavian-American Line maintains a service to Copenhagen from Boston and from New York.

"The practical working of this pool was illustrated recently when one of the largest exporting concerns was approached and without solicitation advised as to what their ocean rate of freight would be for their output for the ensuing season. They were also informed that later they would be advised (1) over what trunk line their shipments should be made; (2) to what ports their shipments should be forwarded; (3) what volume would be assigned to each of the export centers. This is clearly a case where the pool undertook to control, direct and divert as best suited the interest of its members the output of the establishment.

"When a member of the pool is doing more than its apportioned share of the business, shippers are instructed to send their goods to ports from whence other lines make their sailings. A further balance is maintained by the Hamburg-American Packet Company for its own benefit. It orders the shipper to send his goods first to one and then to another of the six United States North Atlantic ports to which it maintains regular lines. Freight shipments are thus manipulated so that the services of the Hamburg-American Packet Company shall not be depleted at one port or overburdened at another."

These are the statements of a comparatively small but old and

*Statement of Peter Wright & Sons in the matter of the complaint against the Hamburg-American Packet Co. for pooling and maintaining monopolies in restraint of trade. June 19, 1907.

very reliable firm which the Hamburg-American Company is now attempting to beat off of the Baltic service. The statements contained in the complaint are common knowledge, although most of them have not been determined in a court of law. Nor were they in any way disproved by the rebuttal of the Hamburg Company's attorneys. The Interstate Commerce Commission did nothing to question or determine their correctness because the complaint was dismissed in March, 1908, on the grounds of lack of jurisdiction to control the ocean lines in any alleged restraint of trade.

The Hamburg Company is therefore allowed to go on undisturbed in its steady accretion of services and virtual control of rates. Unquestionably it has the strongest position and organization to be found among the world's great shipping companies. A virtual witness of this is its ten-fold increase of tonnage in 20 years and its prosperous financial condition.

The evidences of the strength of its position and that of its allies need not be drawn wholly from complaints before the Interstate Commerce Commission.

A freight classification in the ocean-carrying trade is a sign of great stability. The shipowner in the Liverpool-New York trade hardly knows what freight classifications are. His life is a turmoil and a scramble for freight. He cannot make a classification because the exigencies of his competitive business would make him break class *i* before he had completed class *vi*, so he does not classify. But the Germans do. The North German Lloyd and its partners just mentioned have a westbound freight classification of six classes. That for 1906 was printed and distributed in New York in November, 1905, so great is their fore knowledge. It divides freight into six classes and it is currently reported in shipping circles that the rates are maintained as announced.

The character of the goods has a profound influence on rate making and classifying as is shown by the different practices of the Germans in the east and westbound trade. They can maintain a rate going west but do not attempt to do so on eastbound traffic. The difference is largely due to the character of the freight. The trade to the west is largely valuable manufactures which pay high prices. It is in these goods that the classification holds. The six classes do not provide for all articles. Heavy freight is almost excluded from the classification and reserved for special arrangements which are estimated to cover at least 25 per cent. of the traffic of one of these lines. As the eastbound freight is nearly all heavy freight, it is all reserved for special arrangements. This is necessary because goods of this character cannot bear high freight charges and would go to their destination by transshipment from British, Dutch, Belgian or French ports if the German lines were not free to make some adjustment to the current rates. The freight rates on westbound goods, though high per ton, are really low in percentage of value of the goods. This high value makes it unprofitable for much of this class of freight to lose any time in following

planation. The first is the much smaller size of German maritime operations and the shorter shore-line this commerce serves. In Germany there are but two ports engaged in Atlantic foreign trade, and as these are almost twin ports, agreement is geographically simple. In England, there are three different coasts and at least six ports of the first magnitude and many smaller ones, each striving to get a larger share of the national commerce. The second reason may be found in the national characteristics. The Englishman loves his independence and will undergo financial privations to have it. The German has submitted to the national will, has received military drill, has obeyed orders and has moved in companies and masses. He is thereby trained to common action. The third reason is the influence of the German government. The great German steamship companies are probably more nearly a part of the government than are any other important lines in the world. They receive direct or indirect government aid and are benefited by the great desire of Germany to be a sea power. A part of the subsidy is in the form of special railroad rates on export goods on the government railroads. The personal side of this government relation, the lively interest of the German Emperor, who uses the great force of his personal and social prestige to uphold this branch of German sea power, is also important.

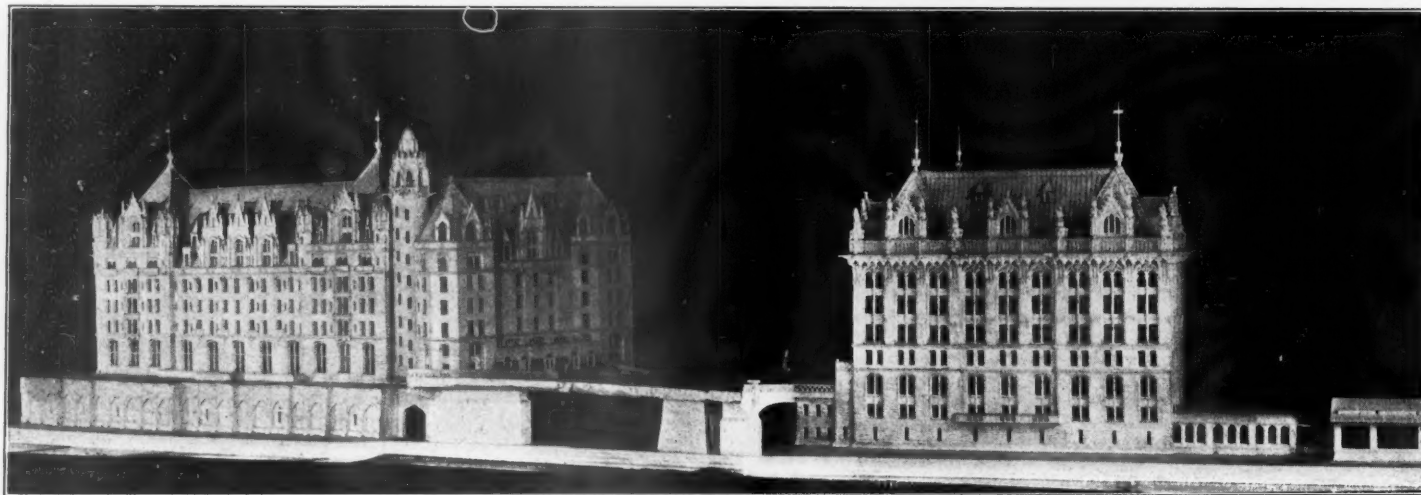
The lines to the southern countries of Europe carry an important part of our trade with the continent, but it is not necessary to give any full account of the rate problems of the lines between the United States and the Mediterranean for the reason that while a complex array of incidents might be marshalled, they show no new principles. The long shore line, the several nations, the many ports combine to destroy any idea of homogeneity. Five jealous peoples have their outlet on the Mediterranean—the French, Spanish, Italians, Austrians and Hungarians, and to add to the variegated aspect the German and English companies have been important factors in the carrying trade to America, which now has at least 15 line services to the North Atlantic ports.

Their history this past 15 years has been as checkered as is the cosmopolitanism of the carriers, wars, agreements, pools—more wars, more readjustments—but nothing different in principle or practice from that which has been narrated in the previous numbers of this series.

(To be concluded.)

Ottawa Union Passenger Station.

The union passenger station at Ottawa, Ont., is being built by the Grand Trunk, to be used by that road, the Canadian Pacific, and the New York & Ottawa. As shown in the accompanying plan, the station will face the new plaza to be formed at the intersection of Dufferin and Sapper's bridges with Rideau street. In connection



View of Ottawa Union Station and Chateau Laurier, Looking Across Rideau Canal.

slower, more devious, but cheaper routes. Hence it becomes the easy prey of the carriers with agreements and classifications.

The London carriers are unique among British-American carriers in that they have a freight classification. It has seven classes and was formed in 1901 by crystalizing the results of long practice. It is instructive to note that it is in a trade controlled by few and strong hands, and that only an estimated 10 per cent. of the traffic is classified—the higher class manufactures. On the other 90 per cent. the agreeing London carriers feel that they must be free to meet the market, which sets the rate for all freight moving in great quantities.

Why do the ocean carriers from Germany to America agree so completely while those from Great Britain compete so constantly? There are at least three reasons that may be cited in partial ex-

planation with the building of the station, a hotel will be erected, on the other side of the plaza, at the southwest corner of Major's Hill Park. This hotel is to be known as the Chateau Laurier.

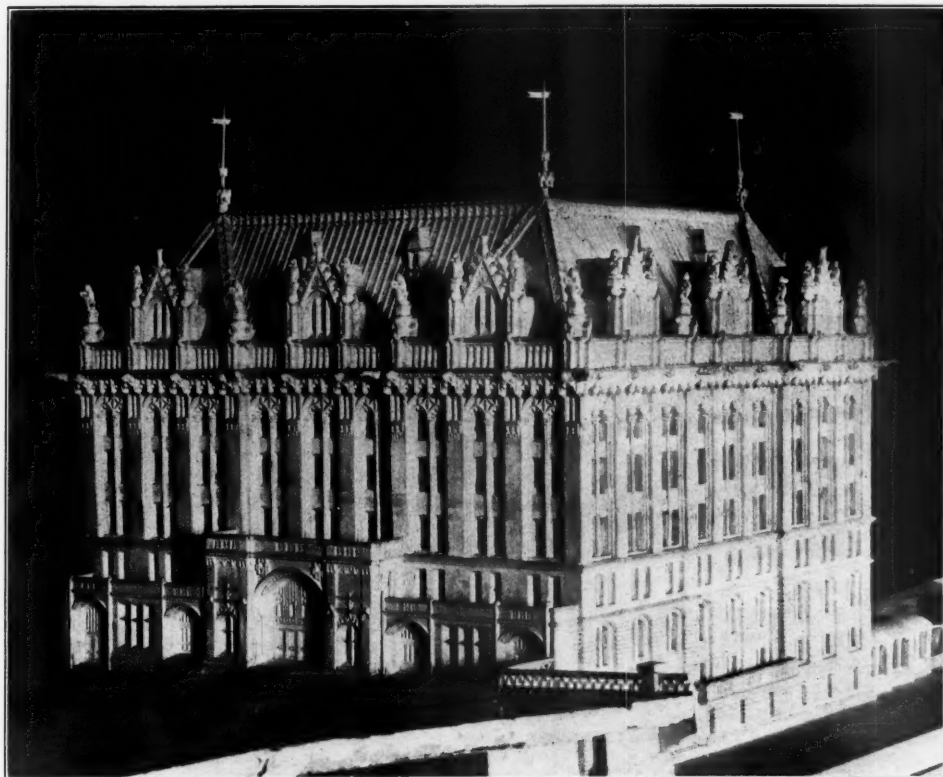
The present Canadian Pacific tracks, as well as those of an electric railway which runs to Hull and outlying points, run between the site of the new station and Rideau canal. The Canadian Pacific line is eventually to be double tracked. It will continue parallel to the canal, running under the plaza formed by roofing over the space between the two converging bridges over the canal. From this point, the line continues along the canal and to the Alexandra bridge across the Ottawa river, over which the through Canadian Pacific trains and the electric cars will operate. The terminus of the electric railway will be under the plaza. The original idea was to make the station a head on instead of a through station;

that is, to put the station at the end of a Y over which all trains would back in from the east and west. This would have made a shorter run to Hull station than the route across the Alexandra bridge, but as the government required that the bridge continue to be used the present plan was adopted. The tracks come into the station from the south, leaving the Canadian Pacific tracks about

28,000 sq. ft. At the north end of the annex there will be another new plaza at the intersection of Sussex and Besserer streets, wide enough to easily take care of carriage service and baggage wagons, while express and mail wagons are provided for in the driveway east of the annex.

Between the train shed and the station building is a concourse 170 ft. x 50 ft. This is at track level; it communicates on the east with the plaza just mentioned, and on the north it leads into the general waiting room, at the same level. The first four stories of the station building proper are used for the passenger station, while the upper stories will be railroad offices. These upper stories are built around a well, the bottom of which is the central dome over the waiting room. From the main waiting room open alcoves and rooms for the ticket office, sleeping car office, information bureau, parcel room, lunch room, etc. At the north end of the waiting room is a broad stairway leading up to the Laurier plaza, which is 22 ft. above the track level. The main waiting room is 52 ft. square, with wide wings each 50 ft. square and 40 ft. high. The women's room 52 ft. x 30 ft., is north of the main stairway, being under the entrance to the plaza, and is well lighted from open areas on each side of the entrance. The smoking room is 32 ft. square; the ticket office, 52 ft. square; the lunch room 52 ft. x 35 ft., and the sleeping car office, telegraph office and information bureau, each 15 ft. x 20 ft. On the mezzanine floor will be the offices of the train despatcher and the station master, and other rooms.

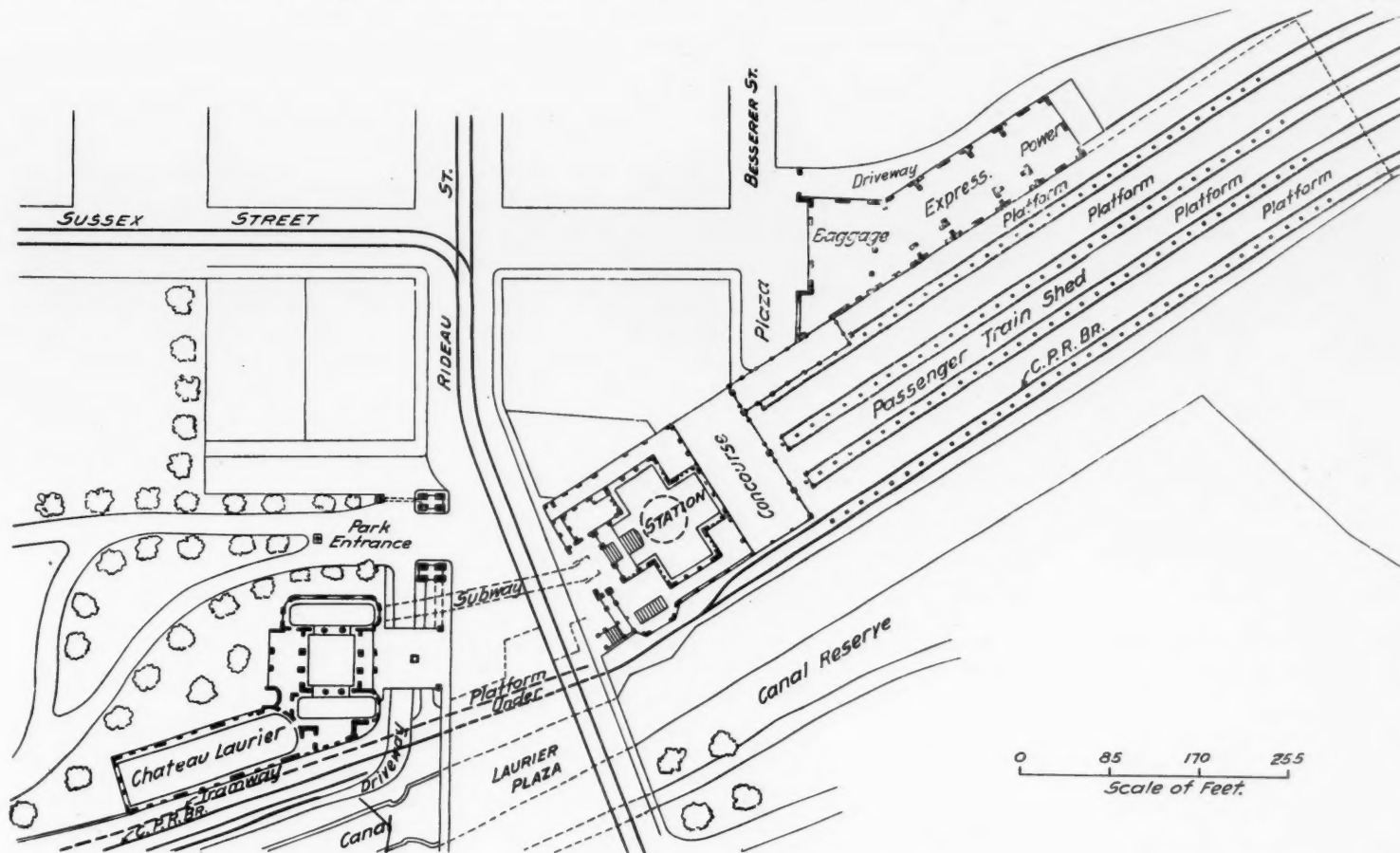
One of the accompanying photographs of models shows the main entrance of the station fronting on the plaza. A smaller entrance leads to a suite of private waiting rooms for the use of government officials and distinguished visitors. Another view of the model shows the station building and also the



View of Station from Laurier Plaza.

2,000 ft. below the station. There will be nine station tracks, served by platforms 20 ft. wide. East of the train-shed is the baggage and express annex, about 350 ft. long, with separate tracks and platforms. This takes care of in and outbound baggage, express and mail. Adjoining it is the power plant and space for coal storage, also second class waiting rooms, the conductors' and trainmen's rooms, customs offices, etc. The ground area of this annex is about

Chateau Laurier. The ground area of the hotel is about 25,000 sq. ft. The main entrance is from the plaza and the service entrance is underneath from the level of the roadway to the canal. There is also a large passenger subway connecting it with the station. The hotel will have over 300 outside rooms and connecting baths, aside from the ballroom, public and private banquet and dining-rooms, cafe, etc. Heat and electric current for light



Location of Ottawa Union Passenger Terminal.

will be furnished from the power plant in the baggage annex.

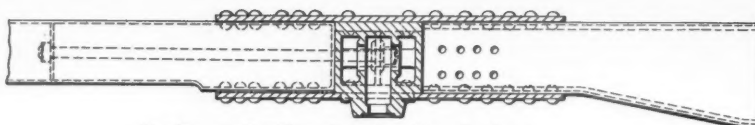
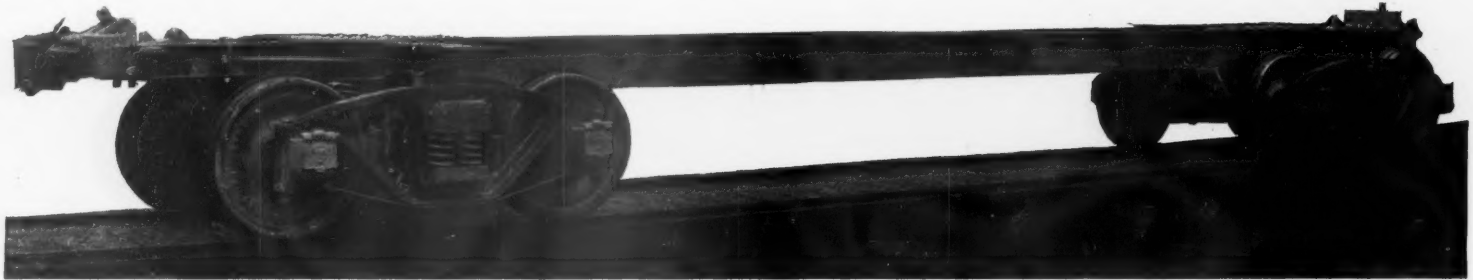
These buildings have been designed to harmonize with the adjacent parliament buildings and the proposed governmental buildings east of Major's Hill Park. The architecture is French Gothic, with a predominating Norman motif. This style lends itself particularly to the construction of the station building, in which the vertical lines of the steel frame have been made prominent. The outside of the buildings will be of stone, and the detail of the upper stories will be in faience. The roofs are to be copper. The entire framework will be steel, and the floors and partitions of concrete or tile.

It used to be customary in working out plans for a terminal of this kind for the railroad's engineering department to prepare the general layout, deciding what areas should be used for station, baggage room and other purposes, and have the architect design the structure within these limits. More recently, better results have been obtained by submitting the problem to the architect, leaving

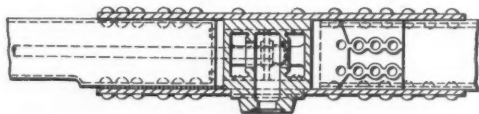
bors do, and new second tracks, etc., are to be constructed accordingly, and old lines are to be changed as occasion offers, but it must be many years before the change is completed. Running to the right was the rule on the first Austrian railroads; a change to the left was made in 1844, when there was not much to change; in 1851 there was a change back to the right, to be changed again as aforesaid.

Metal Draft Frame for Wooden Cars.

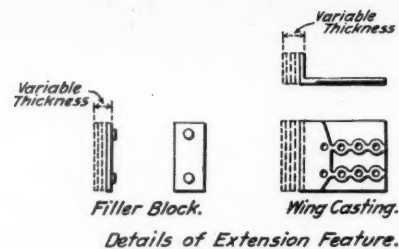
All-wood freight cars are subjected to treatment which greatly increases the cost of maintenance because of the use of high-capacity all-steel and steel underframe cars, heavy locomotives, hump switching yards, etc. To strengthen them so that they are better fitted to withstand these stresses, W. E. Sharp, Superintendent of the Armour Car Lines, Chicago, has designed a steel underframe to be applied to wooden cars now in service, which will give a continuous



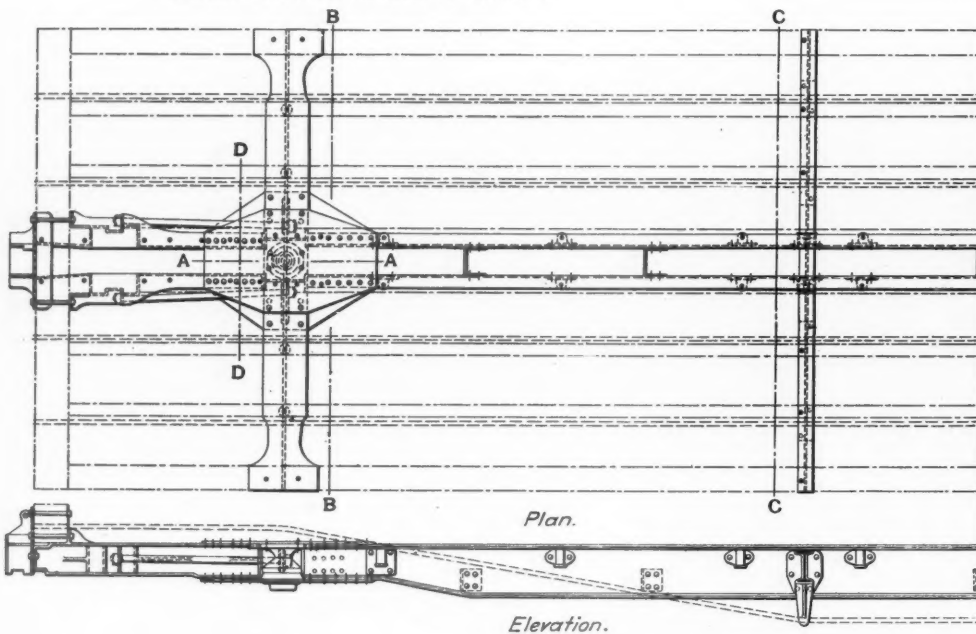
Section A-A, Without Extension Feature.



Section A-A, With Extension Feature.



Details of Extension Feature.



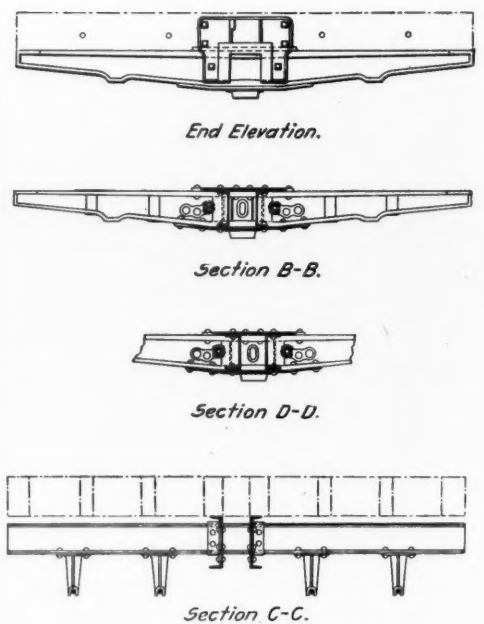
Sharp's Steel Center Sill and Draft Sills for Wooden Cars.

it to him to work out the best layout for handling traffic; the details as to tracks, switches and connections being subject to the approval of the operating and engineering departments of the railroad. The Ottawa Terminal and the Chateau Laurier were designed in this way by Bradford L. Gilbert.

On the Austrian railroads, the rule since 1876 has been for trains to run on the left-hand track, and signals, switches, etc., have been placed accordingly. Meanwhile, in the adjacent countries, Germany, Italy and even Hungary, the trains kept to the right. Now the Austrian authorities have determined to do as their neigh-

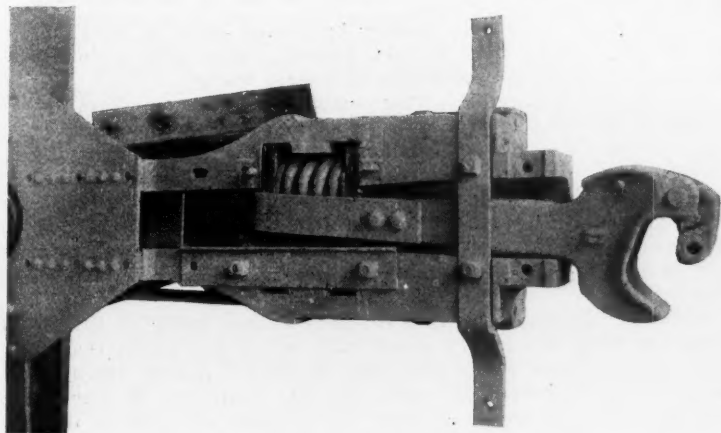
bor do, and new second tracks, etc., are to be constructed accordingly, and old lines are to be changed as occasion offers, but it must be many years before the change is completed. Running to the right was the rule on the first Austrian railroads; a change to the left was made in 1844, when there was not much to change; in 1851 there was a change back to the right, to be changed again as aforesaid.

Detail drawings and photographs are shown herewith. The



draft sills and the dead block are steel or malleable iron. The latter is bolted to the forward ends of the draft sills and extends up the outside face of the end sill. A bracket is cast on the top for the uncoupling lever. Each draft sill has a stop against which the inner face of the end sill bears, with a hole for bolting through the end sill to the dead block. The illustrations show draft sills designed for twin draft springs; they can, however, be made for any design of spring or friction gear.

The lengths of the draft sills and of the center sills are standard, the variations in essential dimensions noted above being met by



Bottom View of Draft Sills.

an extension feature, which is shown in detail in the drawings. To lengthen the distance between bolster and end sill, a filler block is put between each draft sill and the body bolster. To increase the distance between truck centers, a wing casting is riveted to each center sill, with its short arm fitting between the end of the sill and the bolster. The thickness of this wing casting arm and that of the filler blocks vary according to requirements. The filler blocks have lugs which fit into holes in the ends of the draft sills to hold them in place before the frame is riveted up. The draft sills and the center sill are made continuous by two plates passing

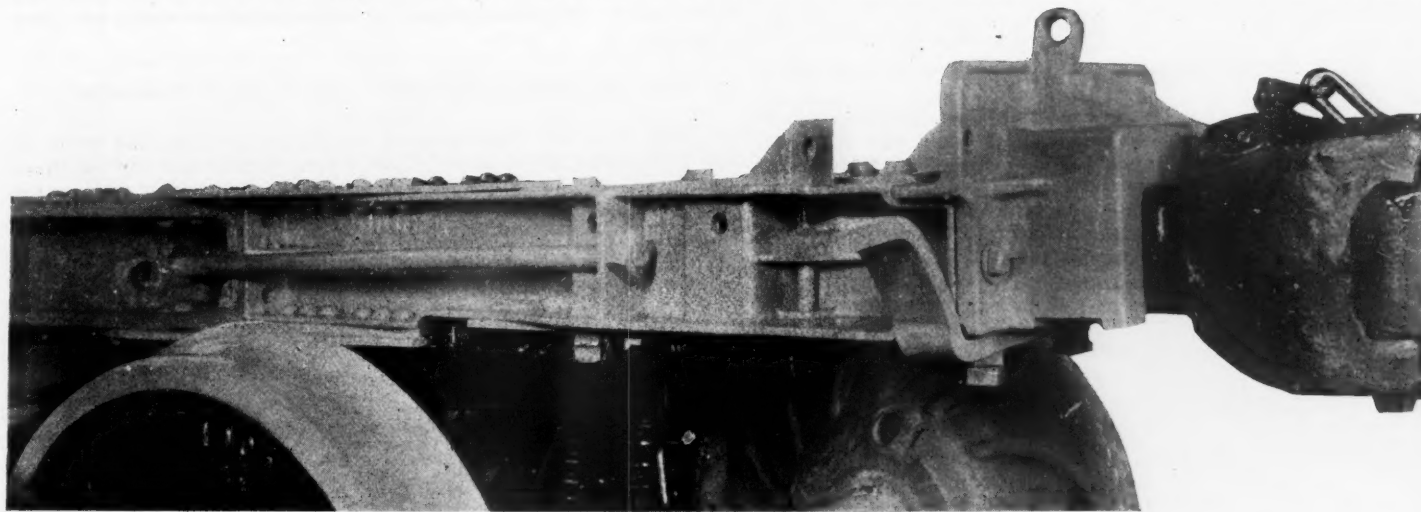
Nankin, the distance in an air line being about 530 miles. The Chinese are to build and own the railroad themselves, under the observation and inspection of engineers and accountants selected by the Europeans, who are to provide £5,000,000 towards the cost. About 175 miles south of Tientsin the line will connect at Tsinan-fu with the German Shantung Railroad.

The railroad around the shoals of the Congo from Stanleyville to Ponthierville, 79 miles, has been completed and steamboats no longer ply on that part of the stream, there called the Lualaba. Stanleyville is about a thousand miles above Stanley Pool, the upper terminus of the old Congo Railroad, and between them steamboats of considerable tonnage ply. Above Ponthierville the Lualaba is navigated to Kindu, about 200 miles further up (south). Thence to Kongolo, 200 miles, south by east, another railroad is to be built, to reach a stretch of river which with a little improvement is said to be navigable for about 400 miles, to the falls of Kalengwe.

Effects of the 16-Hour Law on Trainmen.

From replies received in response to inquiries sent to the principal railroads, it appears that the most important result of the United States law limiting the working hours of trainmen, which went into effect on March 4, has been to equalize the rest periods of those crews who formerly took a long rest at the home end of their runs and a short one at the other end; and to reduce the average income of freight trainmen in numerous cases where the rearrangement of runs has necessitated the employment of additional crews. In a number of cases a run of, say, 160 miles, has been divided so as to leave 120 miles to be operated the same as before, while the other 40 miles is operated by having a crew go out and come back the same day. This arrangement as well as most of the other changes which have been made, makes some increase in the total time spent at terminals, and in this way makes necessary the employment of additional crews; and the payment for the time spent in this added terminal work has in a few cases increased the expense per train-mile to the companies.

Large numbers of roads have reported that no important change was found necessary on their lines; and in the cases of the few roads on which considerable expenditures have been made for new terminal buildings and tracks, we are informed that the changes



Side View of Draft Sills, Showing Buffer Block.

over the top and under bottom of the bolster and securely riveted to the different members. The lower plate is cut out for the top center plate, which is cast integral with the bolster. Each draft sill is strengthened by a rod passing through the body bolster and through a lug cast on the side of the draft sill.

Refrigerator cars of the Armour Car Lines have been equipped with this underframe for a year and no weakness has developed.

Foreign Railroad Notes.

The Austrian authorities have made a special rate on crude petroleum to be used as fuel, coming from the wells in Galicia. This rate is the same per pound as the coal rate. As oil has a fuel value equal to about 1½ its weight of coal, and as the oil tank cars can take no return freight, the coal producers have an excuse for calling this unfair.

The contract has been made between the Chinese government and German and English capitalists for a railroad from Tientsin, the port of Peking, south by east to the Yang-tse-Kiang river opposite

had been planned before the passage of the law. Information received from roads on which changes have been made is given below.

Atchison, Topeka & Santa Fe.—The lengths of the divisions are quite uniform, so that probably the law will result in no serious changes; but crews that have heretofore made their runs in the direction of home after a rest of six or eight hours, will now have to make this rest-period longer.

Atlanta, Birmingham & Atlantic.—A few additional crews put on; only a small part of the whole force is affected by the changes.

Baltimore & Ohio.—About 21 crews will have to take longer rest-periods at that end of their run which is farthest away from home. It was expected that not over a dozen men would have to change residence.

Central of New Jersey.—Some crews which have run out and back the same day will now be run farther and be required to take a rest, as required by law, at the far end.

Chicago, Burlington & Quincy.—A number of runs have been rearranged and additional freight crews are required.

Chicago & North-Western.—A few crews will have to take rest away from home who formerly made round trips.

Delaware & Hudson.—Heretofore freight trains have been running from Binghamton to Oneonta (61 miles) and return, total 122 miles; Albany to Oneonta (83 miles) and return, total 166 miles; Oneonta to Mohawk (72 miles) and return, total 144 miles; Oneonta to Mechanicsville (87 miles) and return, total 174 miles. Under the new arrangement the runs are from Oneonta to Saratoga, 92 miles; Binghamton to Mechanicsville, 149 miles; Binghamton to Albany, 143 miles.

The number of crews who thus have their runs changed from round trip to straight away is 32. The company probably will have to provide new buildings at two points, costing \$2,500, and about 100 men with families will change their residences.

Delaware, Lackawanna & Western.—On one division where traffic is dense the freight trains have been made lighter so as to insure the completion of trips within 16 hours. In numerous cases runs of 100 miles and less, formerly doubled in 15 to 20 hours, are no longer doubled.

Great Northern.—Business is now so light that no changes have been necessary, but, with the road working to its full capacity, some runs will have to be shortened. A number of passenger runs have been changed so that the rest periods of the crews will be more nearly equalized as between the two ends of the run.

International & Great Northern.—Changes were made some time ago to comply with the law of the state of Texas, in which the limit is 14 hours instead of 16, as in the federal law, but only a few changes were found necessary. One Y track had to be put in to be used for turning engines.

Illinois Central (freight runs).—

Old Arrangement.		New Arrangement.	
Memphis to Mounds.....	173 miles	Memphis to Fulton.....	123 miles
Memphis to Paducah.....	169 miles	Fulton to Mounds.....	50 "
Louisville to Paducah.....	225 miles	Memphis to Fulton.....	123 "
Princeton to Nashville and return.....	232 miles	Fulton to Paducah.....	46 "
Memphis to Gwin.....	161 miles	Louisville to Central City.....	125 miles
Vicksburg to New Orleans.....	228 miles	Central City to Paducah.....	100 "
		Princeton to Nashville.....	116 miles
		Nashville to Princeton.....	116 "
		Memphis to Tutwiler.....	92 miles
		Tutwiler to Gwin.....	69 "
		Vicksburg to Willson.....	113 miles
		Willson to New Orleans.....	115 "

About 150 men are affected by these changes, about half of whom will change their residences.

Passenger Runs.—

Old Arrangement.		New Arrangement.	
Evansville to Nashville.....	217 miles	Evansville to Princeton.....	101 miles
		Princeton to Nashville.....	116 "

Kansas City, Mexico & Orient.—One new passenger crew had to be employed.

Kansas City Southern.—The run between Mena and Shreveport (178 miles) has been changed so that now the men will run from Mena to Texarkana, 107 miles; and from Texarkana to Shreveport, 71 miles (round trip, 142 miles). The line from Shreveport to De Quincy (161 miles) will be divided at Hornbeck, 94 miles from Shreveport, and the balance of 67 miles will be covered by a round trip (134 miles). Eighteen crews are affected by these changes. The buildings and tracks required at the new terminals cost \$105,-

three crews will be required where formerly two handled the trains. Three passenger crews on the main line have been changed, but their aggregate mileage is the same. On the Bay City line a passenger run of 237 miles is divided so as to make one of 147 miles and another of 90 miles.

Oregon Railroad & Navigation Co.—The runs of the local freight trains between Starbuck, Wash., and Spokane, 156 miles, have heretofore been divided at Tekoa, 108 miles from Starbuck, but now are divided at Coalfax, 69 miles from Starbuck. The fast freights between Starbuck and Spokane have heretofore run through (146 miles), but now the runs are divided at Tekoa. About 35 men have to change their residences.

Oregon Short Line.—No changes have been made in runs, but about \$35,000 is being spent for new passing tracks, with a view to preventing delays in the movement of freight trains.

Philadelphia & Reading.—This company began some years ago to equalize the runs of trainmen so as to avoid the necessity of excessive hours, and 100 miles is now the maximum for practically all freight and coal trains. In connection with the changes decided on (before the law was passed) the company built two rest houses costing together about \$10,000, one at Bridgeport and one at East Penn Junction. About 1,500 men now have to take rest away from home, though formerly in many cases they made a round trip in 16 hours.

Southern Railway.—On this company's lines many of the divisions are from 150 to 170 miles long, but it was found that to change the terminals would cost about \$2,000,000, a sum which, on account of the business depression, was not available. It was decided, therefore, to have the crew which starts out with a train take it about 120 to 125 miles, and then have a relief crew take it the remaining third of the distance and make the round trip. While this crew is at work the other one has time to rest. The engines and cabooses are not changed at these temporary changing places.

Texas & Pacific.—Trains that heretofore ran from New Orleans to Boyce, 208 miles, now end their trips at Baton Rouge Junction, 89 miles.

Union Pacific.—Between Denver and North Platte, 277 miles, the line is to be divided at Sterling, exactly one-half, but this change was decided on before the passage of the 16-hour law. One freight run of 164 miles is divided into two, one 117 miles long and the other 47 miles. Some of the trainmen will earn 25 per cent. less than before. The headquarters of three passenger crews has been changed.

The Purchasing Department and Common Standards.*

This is a brief description of the present practice and policy of the purchasing department of the Union Pacific and the Southern Pacific and of the co-operation of other departments of the service, which has made its methods practicable and effective.

COMMON STANDARDS.

To obtain the most efficient, economical and satisfactory results for all the lines of these systems, comprising about 18,000 miles,

COMMON STANDARD FREIGHT CARS.

Kind of car.	Capacity		Length		Inside Width		Height		Light Wt. in lbs.	Light Wt. 1,000 pr. ct. of carrying capacity, level full.		Remarks.
	Pounds.	Cu. Ft.	ft.	in.	ft.	in.	ft.	in.		in lbs.	cu. ft.	
Box	100,000	2730	40 ft.		8 ft. 6 in.		8 ft. 1/4 in.		40,803	40.8	14,946	Steel underframe.
*Box	80,000		40 ft.		8 ft. 6 in.		8 ft. 1/4 in.		37,870	47.3	13,872	Steel underframe.
Flat	100,000		40 ft. 10 in.		9 ft. 4 1/2 in.				33,100	33.1		Steel underframe.
Flat, with wooden removable sides and ends.....	100,000	1640	38 ft. 2 in.		9 ft. 2 1/2 in.		4 ft. 8 in.		38,217	38.2	23,303	Decking 2 3/4 in. thick.
*Flat, with wooden removable sides and ends.....	80,000		40 ft. 10 in.		9 ft. 4 1/2 in.				30,644	38.3		Decking 2 3/4 in. thick.
*Flat, with wooden removable sides and ends.....	80,000	1405	38 ft. 2 in.		9 ft. 2 1/2 in.		4 ft. 8 in.		34,806	43.5	24,773	Decking 2 3/4 in. thick.
Stock	80,000	2596	36 ft. 6 in.		8 ft. 5 1/2 in.		8 ft. 1/4 in.		34,978	43.7	13,474	Steel underframe.
Furniture	60,000	3629	40 ft.		9 ft. 9 in.		10 ft. 7 1/4 in.					Steel underframe.
Refrigerator	60,000	2491	39 ft. 10 3/4 in.		8 ft. 2 3/4 in.		7 ft. 7 in.		44,416	74.0		Steel underframe.
(between ice tanks).....		2057	32 ft. 11 3/4 in.		8 ft. 2 3/4 in.		7 ft. 7 in.				21,593	
Gondola	100,000	11783	40 ft. 4 in.		9 ft. 4 1/2 in.		4 ft. 6 in.		30,834	39.8	22,341	All steel with 8 drop bottom doors.
Hopper bottom	100,000	11650	30 ft. 1/4 in.		9 ft. 6 in.		5 ft. 9 1/4 in.		38,754	38.8	23,487	All steel.
Oil	100,000	11700							48,300	48.3	28,412	All steel.
		12,500 gal.										
Work, convertible as gondola car	100,000	1040	40 ft.		8 ft. 8 in.		3 ft.		42,000	42.0	40,385	Steel underframe.
Hopper bottom car....		928	30 ft.		8 ft. 8 in.		3 ft.				45,259	Steel underframe.
Caboose, 8-wheel			29 ft. 7 in.		9 ft. 1 in.		7 ft. 3/4 in.		33,606			Wooden car, steel platform.

*Since 1903 it has not been considered advisable to purchase any 80,000 lbs. capacity box or flat cars, as the cost of these is only about \$60 per car less than the cost of similar 100,000 lbs. capacity cars.

†No 60,000 lbs. capacity furniture cars have yet been purchased. ‡Level full.

000, and about 50 men with families have changed their residences, or will change. The additional time paid to crews in consequence of the new arrangement is estimated at \$105 a month. Six passenger crews have had to change the place of their principal away-from-home terminal.

Louisville & Nashville.—Few crews will have to change residence.

Michigan Central.—One freight run has been changed so that

the management realized several years ago the importance of selecting definite uniform standards of the best practicable designs for many articles used in large quantities by the different departments of the service.

In numerous conferences, which are held periodically, the chief

*Abstract of a paper read before the New York Railroad Club on Feb. 21, 1908, by W. V. S. Thorne, Director of Purchases of the Union Pacific System and the Southern Pacific Company.

officials of each department concerned of the various associated companies have recommended exactly what many of these standards should be. Decisions have been made after considering the advantages from a mechanical and practical as well as from a commercial point of view and after opportunity has been given for argument or suggestions from many experienced and technical men, who have used or manufactured the devices or material in question. Later most of these recommended standards have been favorably passed on by a majority of the general managers of the companies concerned, and when formally approved by the Director of Maintenance and Operation of the associated systems have thus been adopted as common standards for all the associated lines. Where practicable and desirable, detailed and definite specifications and drawings have been prepared, describing and illustrating clearly each common standard.

When formally adopted, any article remains a common standard until it has been formally canceled or superseded by another device, which the officials concerned have voted to be preferable, either on account of greater efficiency, safety, economy, simplicity or other good and sufficient reason. This method has been found to work most satisfactorily in practice and without too much red tape to be objectionable.

When common standards were first considered, it was impracticable to adopt the then existing standards of any one company as common standards for the associated lines, as the various railroads had been under separate management and had different standards of their own. No one line had any design of freight car or passenger train car or locomotive, or more than a few maintenance of way department standards, that could not be greatly improved by suggestions from officials of the other associated lines, from car builders, locomotive builders or other manufacturers, to whom various parts of proposed common standard plans and specifications were submitted for criticisms and suggestions. It was found, however, that certain parts of cars or locomotives, heretofore used as standards by some of the lines, were entirely suitable as common standards, and these were accordingly adopted. Each common standard was therefore adopted strictly on its merits.

ADVANTAGES OF THIS SYSTEM IN MAKING PURCHASES.

Some advantages of this system to the purchasing department are as follows: The variety of similar articles to be purchased is

Common Standard Wooden Passenger Train Cars.

Kind of car.	Length over end sills.	Seating capacity.	Light weight, car complete.
†Coach	60 ft.	70	88,000
†Coach	*69 ft.	82	88,000
†Chair	60 ft.	58	88,000
†Chair	*67 ft. 1 in.	66	88,000
†Baggage	60 ft.	..	85,400
†Baggage	*69 ft.	..	103,000
†Postal	60 ft.	..	101,500
†Baggage and postal	69 ft.	..	104,000
†Diner	72 ft. 6 in.	..	125,000
†Observation-smoker	72 ft. 6 in.

*None of these yet built.

†6-Wheel all steel trucks. †4-Wheel all steel trucks.

*Common Standard All-Steel Passenger Train Cars.

Kind of car.	Length over end sills.	Seating capacity.	Light weight, car complete.
†Coach	60 ft.	70	95,700
†Baggage	60 ft.	..	90,000
†Postal	60 ft.	..	108,000
†Postal storage	60 ft.	..	106,000

*Up to the present time sample all steel passenger train cars only have been built, but it is probable such cars will be ordered exclusively in future and that some slight reduction can be made in weights shown.

†6-Wheel all steel trucks. †4-Wheel all steel trucks.

other than the usual storehouses, thereby avoiding the necessity of carrying as much on hand as formerly.

The light weights given above for common standard all-steel passenger train cars complete include the weights of an axle lighting device and storage batteries which amount to about 6,390 lbs. for each car. These axle lighting devices are to be given a trial, but none has yet been adopted as a common standard.

The weight complete in running order of each four-wheel all steel truck is about 14,400 lbs. and of each all steel six-wheel truck about 20,000 lbs., not including the weight of any axle lighting device.

Many purchasing agents spend half their time trying to secure further definite information than is ordinarily furnished at first in regard to supplies they are asked to buy. They do this in order to have some specifications, even though crude, as a fair basis on which to compare bids and place orders, which will insure to some extent the railroad company's receiving the quality, sizes and kinds of supplies best suited for its requirements. If, therefore, a purchasing agent is supplied with definite and complete specifications and drawings prepared by experts, covering many of the most important articles purchased, the result is certainly a great relief to the purchasing department. It simplifies the work there, not only at the time purchases are made, but later also in lessening the amount of correspondence complaining about defective devices or inferior workmanship or material.

When competing manufacturers are furnished with carefully prepared specifications, and if necessary, drawings also, showing exactly what is wanted, they are then able to figure the closest prices they can afford to name without having to make any allowances for uncertainties. When definite specifications or drawings establish a fair and exact basis for comparing the relative merits of bids, manufacturers will ordinarily submit lower prices for material of the quality specified than they would otherwise. If a manufacturer feels that certain railroad companies will repeatedly purchase from him in large quantities articles of exactly the same kind, and will not change their standards without excellent reason, he will ordinarily quote very low figures hoping thereby to secure such business continuously. By concentrating orders for the same devices or materials with one, or in a few cases with two, well equipped and reliable manufacturers, more uniformity can be secured, and the ordering, inspection and forwarding of shipments are facilitated and accomplished with greater economy. Another great advantage in having intelligent and definite specifications and drawings is that it facilitates a fair inspection, and, when articles are furnished in accordance with definite conditions, there is far less uncertainty as to results that will be obtained by their use.

INSPECTION BUREAU.

An inspection bureau well equipped with mechanical and chemical testing laboratories and with a corps of experienced inspectors has proved most useful and necessary. To this department copies of many orders placed by purchasing agents are sent so that proper attention may be given to inspection of quality of workmanship and material of supplies and equipment furnished, and so that weights and conformity to standards, etc., may be properly checked. This department has also rendered much assistance in the preparation and revision of specifications and drawings.

The following examples will illustrate to what extent many of the articles purchased for the Union and Southern Pacific lines have been standardized by the operating and motive power departments.

ROLLING STOCK EQUIPMENT.

As all rolling stock is likely to be transferred from one line to another, and as new cars and locomotives and repair parts for such equipment form the largest items purchased by railroad companies,

COMMON STANDARD LOCOMOTIVES.

Class	Passenger Locomotives			Freight Locomotives		
	Atlantic.	Pacific.	*Ten-Wheel.	Consolidation.	Mogul.	Switch.
A 81-20/28-105	P 77-22/28-141	T 63-22/28-160	C 57-22/30-187	M 63-20/28-140	S 51-19/26-140	
Cylinders	20x28	22x28	22x28	22x30	20x28	19x26
Diameter of driving wheels	81	77	63	57	63	51
" " truck wheels	33 1/2	33 1/2	30 1/2	30 1/2	30 1/2	26
" " trailing wheels	51	45	200	200	200	175
Boiler pressure	200	200	200	200	200	175
Boiler dia. of 1st course, outside	70	70	72	80	70	65
Total weight on drivers	105,000	141,000	160,000	187,000	140,000	140,000
" of engine	196,000	222,000	203,000	208,000	162,000	140,000
" heating surface	2649	3048	2994	3403	2102	1557
Firebox	108x66	108x66	124x37 1/4	108x66	108x66	108x40 1/4
Grate area	49.5	49.5	32.1	49.5	49.5	30.2
Heating surface to grate area	53.5	61.6	93.3	70.0	42.0	51.0
Tractive power (M. E. P. considered 85 per cent. of boiler pressure)	23,506	29,920	36,570	43,305	30,222	27,376
Adhesive weight to tractive effort	4.47	4.71	4.38	4.32	4.63	5.11

*For mountain service.

The above weights and dimensions, etc., are for coal burning locomotives. Common standard oil burning locomotives are identical except that grates are omitted, and ash pan is modified, and oil burning apparatus and connections and fire brick are added without materially affecting weights.

reduced to a minimum. Many standards for all the associated lines being uniform, stocks of material carried on hand at different points are interchangeable to a much greater extent than formerly, and, in case of emergency, material can be drawn with little delay from

it was considered most important to have these of as uniform and good designs as possible for all the associated lines.

After several conferences, the officials concerned decided to have definite specifications and detailed drawings of what has been called

common standard cars and locomotives as shown in the accompanying tables. It was thought that these would include practically all of the different types of such equipment which it might be advisable to purchase in the near future for ordinary use on any of the lines.

Common Standard Locomotive Tenders.

	Shape of Tank			
	Cylindrical.	Cylindrical.	Rectangular.	Sloping Rectangular.
Water capacity.....gal.	7,000	9,000	9,000	4,000
Coal capacity.....net tons	14	14	10	6
Weight empty.....lbs.	48,720	53,980	63,000	39,770
*Wt. with coal and water.	135,050	156,980	158,000	85,100
Fuel oil capacity of these tenders when fitted for use with oil burning locomotives.....gal.	2,940	2,940	2,850	1,020
Additional weight of such tenders empty, is in lbs. about.....	6,130	6,130	8,400	3,780

*For passenger service tenders are equipped with vestibule, which adds about 4,660 lbs. to the weight of cylindrical tenders, and about 3,240 lbs. to the weight of rectangular tenders.

Common standard tenders for oil burning locomotives are identical with those for coal burning locomotives, except that tank for fuel oil is placed in coal box, and piping connections to locomotive firebox are added. Having determined the general types of cars and locomotives to be purchased in future the question of detailed plans and specifications for each and every part, no matter how small, of all such equipment was then given the most careful consideration, and care was taken to follow M. C. B. or M. M. adopted or recommended standards.

UNIFORMITY OF PARTS.

In designing all types of common standard freight cars the principle was strictly adhered to of using identically the same parts in different types of cars wherever suitable, in order to minimize variety and to have as many parts as possible interchangeable. The same practice was also followed in designing common standard locomotives and passenger train cars.

This plan not only proves of great advantage to the railroad companies from a maintenance point of view, in facilitating the making of repairs without delay, but it also lessens the variety, amount and value of material necessary to carry in stock. Uniformity of parts, wherever practicable, is also of value to car and locomotive builders, as it reduces considerably the variety of patterns, dies, templates and blue-prints, which they would otherwise have to make if building more than one type of car or locomotive, thereby enabling them to make slightly lower prices.

SPECIALTIES FURNISHED BY THE RAILROAD COMPANY.

In making common standard plans and specifications for equipment, it was naturally found that there were numerous parts of cars or locomotives, among them many patented devices, which car or locomotive builders had no special facilities for making or could not make. These specialties the railroad companies could purchase direct from the manufacturer at lower prices and with better assurance of prompt deliveries than the car or locomotive builders could obtain, particularly if the railroad companies signified their willingness to adopt such specialties as their standards until they found something better, or just as good, and enough cheaper to justify a change. Another inducement to manufacturers to name low prices has been that if specialties made by them were used as common standard by any large railroad system, it would advertise their wares and assist them in getting business from other companies.

Therefore, in buying new equipment, the Union and Southern Pacific systems have found it advantageous to furnish free of charge to the car or locomotive builders the following specialties:

For Common Standard Freight Cars.

Air brake equipment	Brake shoes
Bearings, journal	Couplers, M. C. B.
Bolsters, body, cast steel	Door bolt keepers for refrig. cars
Brake Adjuster equipments.	Door fasteners
Brake beams	Door fixtures
Door insulation for refrig. cars	Springs, truck and draft
Draft rigging	Steel platforms for cabooses
Journal boxes, M. C. B.	Truck bolster, truck center plates and dead lever anchors
Refrigerator air syphons	Truck side frames, cast steel
Refrigerator car lining	Wheels, rolled steel (in special cases only).
Roofs, metal	
Side bearings, truck	

For Common Standard Passenger Train Cars.

Air brake equipment	Electric fans for dining and observation cars
Air signal equipment	Lid, bolt and spring for journal boxes
Bag racks for postal cars	Lighting equipment
Bearings, journal	Mail catchers for postal cars
Brake adjuster equipments	Ranges for dining cars
Basket racks, metal	Refrigerators for dining cars
Body bolsters, cast steel	Steel platforms
Brake beams	Seats
Brake handles	Side bearings, truck
Brake shoes	Springs, truck and draft
Car couplers	Steam heating system equipment
Cinder guards for postal cars	Trap door fixtures
Closets, Duner for observation and dining cars	Truck steel castings
Coffee urns for dining cars	Vestibule parts
Curtain and rollers, vestibule	Wash stands
Diaphragms and attachments, vestibule	Water coolers
Draft gear	Water heaters for dining cars
	Water filters for dining cars
	Wheels, rolled steel

For Common Standard Locomotives and Tenders.

Acetylene gas generators	Sanders
Air brake equipment	Side bearings, truck
Air signal equipment	Springs
Bearings, axle	Staybolts, flexible
Bell ringer	Steam chest valves for switch engines
Brake adjuster equipment	Steam gages
Brake beams	Steam and oil conduits
Brake shoes	Steam heat equipment
Couplers, M. C. B.	Steam heat gages
Draft rigging	Steam heat reducing valves
Feed pipe strainers	Throttle valves
Hose, tank	Tires for driving and trailing wheels
Headlights, acetylene and electric, and apparatus for the same	Truck bolsters, truck center plates and dead lever anchors
Injectors	Truck side frames, cast steel
Journal boxes, M. C. B.	Vestibule diaphragms and attachments for passenger locomotive tenders
Lubricators	Water gages
Packing for piston rods	Wheels, rolled steel, engine and tender truck
Packing for valve stems	Whistles
Safety valves	

The cost of these specialties furnished by the railroad for new common standard freight cars is from 20 to 30 per cent. of the total cost of the car complete. For new common standard passenger train cars it averages from 30 to 40 per cent. of the cost of the car complete, and for new common standard locomotives it is approximately from 12 to 15 per cent. of the cost of the locomotive complete. This leaves to the car or locomotive builders only plain and regular work to figure on when requested to submit bids. As they should be well equipped to perform such work, they should be able to quote closer figures than if also required to secure quotations on short notice from other manufacturers, on the specialties referred to above, the close prices of which they are not always familiar with, and could not in many cases easily obtain.

FORM OF SPECIFICATIONS FOR CARS AND LOCOMOTIVES.

The Union Pacific and Southern Pacific have found it desirable to have all specifications for common standard cars and locomotives printed on pages M. C. B. size 8 1/4 in. by 10 3/4 in., to secure uniformity, correctness and compactness. It has been found convenient and desirable to bind under separate covers specifications for the following:

Approximate Number of Printed Pages in Each.

Each different type of freight car.....	14 to 21
Each different type of passenger train car body.....	23 to 38
Four-wheel passenger train car trucks.....	5
Six-wheel passenger train car trucks.....	5
Each different type of locomotive.....	16 to 18
Each different type of tender.....	8 to 9

SCHEDULES.

As a part of common standard freight car specifications, separate schedules have been made describing in full detail each of the different kinds and parts of specialties furnished by the railroad f.o.b. the car builders' works. On each schedule is shown the name and address of the manufacturer of the article referred to and a list of the different types of common standard freight cars on which such specialties are used. The schedules also show on what common standard drawings the devices or parts thereof are illustrated, and with what common standard material specifications (if any) or with what other specifications the material furnished must comply. Information in regard to the weight of the device and the kinds of material and parts of which it is made, etc., is also indicated where desirable. By reference to these schedules officials of the railroad companies and car builders can see exactly what material the railroad is to furnish, and, when these specialties are ordered, if reference is made to schedule number and date and to the number of cars of specified types for which the material is wanted, manufacturers and inspectors will be fully informed as to what should be furnished.

NUMBERING OF SCHEDULES.

For purposes of easy reference, schedules are numbered consecutively and in alphabetical order.

PREFIXES TO SCHEDULE NUMBERS.

To designate the kind of equipment to which the schedules apply, the following prefixes are used in front of their numbers: P, for passenger train cars; L, for locomotives and tenders; for freight cars no prefix letter is used.

SUFFIXES TO SCHEDULE NUMBERS.

Where two or more schedules are necessary to clearly describe different varieties of the same kind of specialties, which may be furnished for different types of the same kind of equipment, the same schedule number is used, but the letter a, b or c, etc., is suffixed to the number for the purpose of identifying each variety of schedule. Thus, the schedule, describing air-brake equipment for freight cars weighing light more than 35,000 lbs. where combined air cylinder and reservoir is used, is numbered 1a. Schedule 1b describes air-brake equipment furnished for freight cars weighing light more than 35,000 lbs., where a detached air cylinder and reservoir are used. Schedule 1c describes air-brake equipment furnished for freight cars and cabooses weighing less than 35,000 lbs. light.

SCHEDULES BOUND UNDER SEPARATE COVER.

All of the 36 schedules applying to common standard freight cars, consisting of about 50 printed pages, are bound with an index

under separate cover. As they apply to all or some types of common standard freight cars, this avoids the necessity of inserting and repeating this information in detail in the specifications of each different type of freight car. As the car builder does not furnish the specialties described in the schedules and is not responsible for them—only applying them to the cars—it is more convenient for him as well as for the officials of the railroad companies to have the schedules separated from that part of the specifications for which the car builder is responsible. Likewise, as a part of common standard passenger train car and locomotive and tender specifications, schedules describing specialties furnished by the railroad for such equipment are made and are bound with an index under separate cover for the same reasons. The 65 schedules for passenger train cars, consist of about 91 printed pages, and the 49 schedules for locomotives and tenders, of about 84 pages.

MATERIAL SPECIFICATIONS.

As a part of common standard specifications, the material specifications mentioned below have been printed, describing quality, workmanship or test requirements, etc., of each of the materials named. As these material specifications apply to all different types of cars or locomotives they are bound with an index in alphabetical order under separate covers to avoid the necessity of repeating this detailed information in specifications for each different type of car or locomotive.

	Frts. Cars.	Pass. Train Cars.	Loco- motives.
Axles, steel for cars and tenders.....	x	x	x
Bearing metals, babbitt and bell metal.....	x	x	x
Castings, malleable iron.....	x	x	x
Castings, steel.....	x	x	x
Chain.....	x	x	x
Couplers, M. C. B., automatic.....	x	x	x
Forgings, steel and blooms for same.....	x	x	x
Hose, rubber.....	x	x	x
Iron, merchant bar, double refined.....	x	x	x
Staybolt and boiler brace iron.....	x	x	x
Lumber.....	x	x	x
Oil, linseed.....	x	x	x
Paint.....	x	x	x
Pipe, steam, gas and water (black and galvanized).....	x	x	x
Pipe, copper and brass.....	x	x	x
Pipe, wrought iron dry pipe.....	x	x	x
Plates, steel for steel cars.....	x	x	x
Plates, steel, for boiler, firebox and tank.....	x	x	x
Rivets.....	x	x	x
Spring steel and springs, elliptical and coil.....	x	x	x
Structural steel shapes.....	x	x	x
Tires, steel for locomotive driving and trailing wheels.....	x	x	x
Tubes, boiler.....	x	x	x
Turpentine.....	x	x	x
Waste, cotton and wool.....	x	x	x
Wheels, rolled steel, for engine and tender trucks and passenger train cars.....	x	x	x
Wheels, chilled cast iron.....	x	x	x

Material specifications for freight cars consist of about 40 printed pages, for passenger train cars of about 39 pages and for locomotives of 40 pages.

DRAWINGS.

To illustrate fully all details of different types of common standard equipment referred to above, the following number of working drawings have been found necessary:

For freight cars.....	about 1,300
For wood passenger train cars.....	800
For steel passenger train cars.....	625
For locomotives and tenders.....	1,100

These drawings are made of the following common standard outside dimensions, including border, so that they may be folded conveniently with correspondence. In the case of locomotive drawings the standard sizes used by the Baldwin Locomotive Works are followed:

For Freight Cars.	For Passenger Train Cars.	For Locomotives.
11 in. x 15 in.	11 in. x 15 in.	13 1/4 in. x 16 1/4 in.
15 in. x 20 in.	15 in. x 20 in.	16 1/4 in. x 22 1/2 in.
23 in. x 30 in.	23 in. x 30 in.	19 1/4 in. x 23 3/4 in.
	29 1/2 in. x 41 in.	

In addition there are a few special sizes for drawings illustrating general designs, underframes and brake arrangements.

It is customary to show on each common standard car or locomotive drawing, in the upper right-hand corner, a list of each different type of car, locomotive or tender on which the device illustrated is used, and, in the upper left-hand corner of each drawing, the latest date of revision is indicated. The title and drawing number are shown in the lower right-hand corner. All common standard freight car drawings bear the prefix letter "C" in front of the number, locomotive drawings have the prefix "CA," and passenger train car drawings, the prefix "CB," for the purpose of indicating that they are common standard drawings and to what type of equipment they refer. Drawings illustrating articles referred to in any schedule bear a note referring to such schedule number. Notes are also placed on drawings, where advisable, referring to numbers of material specifications concerned.

PREFIXES TO PATTERN NUMBERS.

The following prefixes to common standard pattern numbers have been adopted and are shown on drawings illustrating articles concerned, and on patterns to designate the type of equipment on

which castings referred to are used and the material of which castings are made.

Castings of	Frts. Cars.	Passenger Train Cars.	Locomotives.	Maint. of Way Dept.
Cast Iron.....	C.	CB	CA	M.W.
Malleable iron.....	CM	CBM	CAM	M.W.M.
Steel.....	CS	CBS	CAS	M.W.S.
Brass.....	CF	CBF	CAF	M.W.F.

INDEXES OF COMMON STANDARD DRAWINGS FOR CARS OR LOCOMOTIVES.

The following are also a part of common standard specifications and are each bound under separate cover:

Alphabetical index of freight car drawings.....	about 56 pages
Numerical index of freight car drawings.....	36 "
Alphabetical index of wood passenger train car drawings.....	79 "
Alphabetical index of all steel passenger train car drawings.....	51 "
Numerical index of wood passenger train car drawings.....	23 "
Numerical index of all steel passenger train car drawings.....	18 "
Alphabetical index of locomotive drawings.....	78 "
Numerical index of locomotive drawings.....	34 "

In the numerical and in the alphabetical index of common standard freight car drawings a separate vertical column is provided for each different type of car, and opposite each drawing number and title an "X" is placed in the respective vertical column or columns to indicate on which type or types of cars the details illustrated on each drawing referred to are used. In this way it is easy to see at a glance on how many and on which types of cars the articles illustrated on each drawing are required. A similar practice is followed in the case of indexes of drawings of common standard passenger train cars and locomotives. Numerical indexes of drawings also show the latest date of revision of each drawing.

SUPPLEMENTS TO SPECIFICATIONS AND REVISED DRAWINGS.

As it becomes advisable from time to time to revise specifications, material specifications, schedules or indexes of drawings, supplements thereto numbered and dated are issued, and when such supplements become too voluminous, the entire specifications, etc., are reprinted to include all corrections and additions and are given a new date. New or revised drawings are likewise made and distributed whenever changes or revisions are authorized.

DISTRIBUTION OF MECHANICAL DEPARTMENT DRAWINGS, SPECIFICATIONS, ETC.

Copies of common standard specifications and drawings of cars and locomotives, or any supplements or revisions of same, when issued, are distributed to the Director of Maintenance and Operation of the Union Pacific and Southern Pacific; to the general manager and superintendent of motive power of each associated line; and to the inspection bureau. Sufficient copies are also sent to the Director of Purchases for distribution at the same time to car or locomotive builders who may be asked in future to submit bids, so that when it is desired to order new equipment, prices can be obtained, orders placed and construction work commenced with the least possible delay.

In distributing such drawings it is customary to send negative prints to each superintendent of motive power and to the car or locomotive builders who may be successful bidders, to enable them to reprint from these negatives whatever additional white or blue prints may be needed by officials of their company or in their shops. The manufacturers of any common standard specialties are supplied with copies of schedules and negative prints of each common standard drawing referred to in the schedules describing the articles to be furnished by them, so that from these they may easily provide such additional copies as are needed by their employees, for reference in connection with orders or correspondence. Local purchasing agents are also furnished with copies of these schedules and drawings referred to therein, so that they have this information for reference in placing orders under agreements made with the manufacturers by the Director of Purchases.

OTHER ADVANTAGES OF DEFINITE SPECIFICATIONS FOR CARS AND LOCOMOTIVES.

In having definite and detailed specifications for cars and locomotives, which do not change very much from year to year, there are two other important advantages. One of these is that where a car or locomotive builder has once built equipment to these specifications he will have on hand most of the necessary dies, templets, patterns, etc., for use in duplicating such equipment, without incurring as much additional expense or delay as would be involved if entirely different designs of cars or locomotives were ordered from year to year. The other advantage is that having bought cars and locomotives under similar specifications for several years, it is not difficult at any time for the railroad's representative to determine at what price it is fair to ask builders to furnish similar cars or locomotives, considering general conditions.

COMMON STANDARD PARTS USED WHERE PRACTICABLE IN REPAIRING OLD EQUIPMENT.

Wherever possible, common standard parts are used in making repairs to old equipment which was not originally built in accordance with common standard specifications. If this is not practicable, of course whatever is necessary must be purchased.

COMMON STANDARD CARS, LOCOMOTIVES AND RAILS PURCHASED.

Since the adoption of common standard specifications 1,140 locomotives, 459 passenger train cars and 31,845 freight cars have been

built in accordance therewith and 860,000 gross tons of rails have been purchased.

MAINTENANCE OF WAY DEPARTMENT STANDARDS.

The following examples will illustrate how some of the articles purchased for the Union Pacific and Southern Pacific have, in like manner been standardized by the maintenance of way and operating departments.

Common standard specifications have been prepared for:

Angle bars	Steel rails
Battery material	Screw spikes
Chloride of zinc	Storage batteries
Creosote	Ties
Frogs, switches and crossings	Track bolts and nuts
Nut locks	Track spikes
Paint	Tie plates, rolled steel
Steel railway structures	Wire, rubber insulated copper signal

Common standard drawings have been prepared to illustrate fully all details of the following, which are supposed to include sufficient varieties of sizes and kinds of the articles mentioned to meet the requirements for new work in the near future of any of the associated lines, or for maintenance, where such standards are applicable:

Brackets, pins, cross arms and glass insulators for signal installations.

Bridges, single track:

Deck girders, 20 ft. long.

Deck plate girders, 30, 40, 50, 60, 70, 80, 90 and 100 ft. long.

Through plate girders, 30, 40, 50, 60, 70, 80, 90 and 100 ft. long.

Through riveted spans, 100, 110, 125, 140 and 150 ft. long.

Through pin connected spans, 150, 160, 180 and 200 ft. long.

Bridges, double track:

Through plate girders, 50, 60, 70, 80 and 90 ft. long.

Through riveted spans, 100, 110, 125 and 140 ft. long.

Through pin connected spans, 150, 160, 180 and 200 ft. long.

Steel deck turntable, 80 ft. long.

Frogs:

Rigid frogs, No. 6—9 ft. long.

No. 7—10 "

No. 9—12 "

No. 14—18 "

Spring rail frogs, No. 10—15 ft. long.

No. 12—16 ft. 6 in. long.

Crossing frogs, when angle of crossing is less than 27 deg.

when angle of crossing is 27 deg. or larger.

Guard rail with adjustable clamp.

Nut locks.

Rails:

Common standard section steel rail, weighing 90 lbs. per yd.

Common standard section steel rail, weighing 75 lbs. per yd.

Rail joints:

Continuous rail joints, 27 in. long, with 4 bolt holes, weighing 86 lbs.

per pair for 90-lb. rail.

Continuous rail joints, 27 in. long, with 4 bolt holes, weighing 76 lbs.

per pair for 75-lb. rail.

Insulated continuous rail joints, 26 in. long, with 4 bolt holes, weighing

86 lbs. per joint for 90-lb. rail.

Insulated continuous rail joints, 26 in. long, with 4 bolt holes, weighing

75 lbs. per joint for 75-lb. rail.

Split switches:

10 ft. long, not insulated and insulated.

15 ft. long, not insulated and insulated.

24 ft. long, not insulated and insulated.

20 ft. long, Wharton switch.

Steel water tanks and supports:

65,000 gal. capacity for cold climates.

65,000 gal. capacity for mild climates.

Screw spikes, $\frac{11}{16}$ in. x $5\frac{1}{2}$ in.

Semaphores:

High semaphore with signal.

Station semaphore signal.

Switch stands, high and low.

Track bolts and nuts, $\frac{3}{8}$ in. x $4\frac{1}{2}$ in. and $\frac{7}{8}$ in. x $4\frac{5}{16}$ in.

Track spikes, $\frac{9}{16}$ in. x $5\frac{3}{8}$ in.

Tie plates:

Flat bottom, rolled steel, $\frac{7}{16}$ in. x 8 in. x $8\frac{1}{2}$ in., weighing 6.6 lbs.

each, for use with 90-lb. rail.

Flat bottom, rolled steel, $\frac{7}{16}$ in. x 8 in. x $8\frac{1}{2}$ in., weighing 6.4 lbs.

each, for use with 75-lb. rail.

Taper rails, for connecting heavy with lighter rails.

DISTRIBUTION OF MAINTENANCE OF WAY DEPARTMENT DRAWINGS AND SPECIFICATIONS.

Copies of maintenance of way department common standard drawings and specifications, or any supplements or revisions thereof, are distributed to the Director of Maintenance and Operation; to the general manager, chief engineer and local purchasing agent of each associated line, and to the inspection bureau. Copies are also sent to the Director of Purchases for distribution to manufacturers who may be asked to submit bids in regard to furnishing the devices referred to. In distributing such drawings it is customary to send negative prints to each chief engineer and to each manufacturer, with whom the associated lines may have an agreement in regard to furnishing the articles illustrated on such drawings. This enables them to print whatever additional white or blue prints are needed by officials of their company or in their shops.

COMMON STANDARDS ADOPTED ON MANUFACTURERS' RECOMMENDATIONS.

Besides the common standards already referred to, for which the railroads have prepared their own specifications and drawings, a number of other articles have been adopted as common standard by accepting the specifications, descriptions, drawings or illustrations offered by some manufacturer, and making an agreement with him to furnish such of these as the associated lines require or may desire to purchase. In such agreements the manufacturer recommends, in a manner satisfactory to the railroad's representative, what he thinks will be most suitable for use as common standards for all ordinary requirements and conditions, bearing in mind the advisability of having as few varieties of sizes and kinds as is consistent with good practice.

The following are examples of some of these articles:

Car seals and ratchet seal presses	Replacers, car and engine
Electric lamps, incandescent	Rubber bands,
Erasers, rubber and steel	Safes and vault doors
Fuses and torpedoes	Scales
Hand cars, push cars and track	Soap
velocipedes	Soda ash
Inks and adhesives	Signal material, mechanical interlock-
Jacks	ing
Lamps, engine and coach tail	Signal material, automatic block
Lamps, switch and semaphore	Storage cells for signal work, gravity
Lanterns, hand	zincs and coppers for same, battery
Mail cranes	connectors and lightning arresters.
Nut and bolt fasteners	Telegraph and telephone line material
Oil, illuminating, signal, lubricating,	and pole equipment.
fuel, gasoline, etc.	Track tools
Padlocks and keys for signal work	Tracing cloth, blue print paper, profile
Padlocks and keys for switches	and drawing paper, etc.
Pantasote	Trucks, warehouse and baggage
Pens	Typewriters, covers, ribbons, etc.
Penholders	Wire rope
Pencils and pencil point protectors,	Wire, barbed and plain, and telegraph,
timber crayons, etc.	telephone and signal pulling.

STATIONERY FORMS.

By conferences between representatives of the department concerned of each of the associated lines a very large number of stationery blanks, envelopes, blank books, etc., have been standardized as to quality, weight and size of paper and as to printed matter thereon. Thus the variety of these forms and papers heretofore used by all the associated lines has been greatly reduced and the arrangement of the blanks, quality of paper, etc., have been more intelligently suited to their purpose. Samples of each of these blanks as finally adopted with estimates of quantities of each required annually have been furnished to a number of the largest printing establishments for the purpose of securing bids.

Based on the most favorable propositions received, agreements have been made with certain printers covering specified blanks, whereby similar forms used by the associated lines are purchased from the same printer. Most of these agreements for stationery forms, etc., have been made to continue without expiration until a certain number of months notice by either party to the other, with the understanding that if the railroad companies cancel the agreement or change any of the forms referred to, they will take off the printer's hands all stock of such forms as he may have at the time, up to a maximum of one year's estimated requirements. This enables the printer to print forms in large quantities, and therefore economically. It is stipulated that when the printer's stock of any particular form becomes low he shall receive proper authority from the General Stationer of the associated lines as to what changes, if any, are to be made before the next supply of such forms is printed. If changes which involve increased or decreased cost are ordered in any forms, and these cannot be adjusted to mutual satisfaction, new bids on such revised forms are asked for, and new agreements or supplements to existing agreements are made accordingly.

These stationery forms, etc., are divided into three classes: Common standard forms, of which there are now about 600 different kinds, which are identical for all of the associated lines; standard forms, of which there are now about 500 different forms or 2,000 blanks, which are identical for all the associated lines, except as regards the name of the railroad company or titles of officials, etc.; and local forms, which are used by one line only, to meet local conditions.

PURCHASING AGENCIES.

The lines composing the Union Pacific and Southern Pacific systems have a Director of Purchases located at New York City, and seven local purchasing agents at different important points on the systems.

AGREEMENTS MADE BY DIRECTOR OF PURCHASES.

New cars, locomotives, miscellaneous equipment, rails and a few other supplies of importance are ordered by the Director of Purchases direct from the builders or manufacturers after securing competitive bids in each case, and copies of all such orders placed are sent to the various officials concerned. Continuing agreements with manufacturers, on behalf of all the associated lines are made by the Director of Purchases, covering the purchase of many articles, especially those heretofore mentioned, for which common standard specifications or drawings have been adopted. Copies of all such agreements are forwarded to the Director of Maintenance and Operation, to each general manager, local purchasing agent, and to the head of the department concerned of each associated line. Based on these agreements, the local purchasing agents may send their orders direct to the manufacturer, as soon as they receive requisitions, without having to waste further time or labor in correspondence regarding specifications, prices, etc.

Much labor can be saved and better results can usually be obtained by having one central agency negotiate such agreements, which can be used by all of the associated lines, rather than by obliging each local purchasing agent, who is not so well equipped or so well located for the purpose and has not so large a volume of business to offer, to act independently.

SUPPLEMENTS TO AGREEMENTS.

In case it is necessary from time to time to revise existing agreements, supplements to these are made and distributed to all

concerned. Each agreement is given a different number and each supplement is numbered in numerical order for purposes of reference.

SLIDING SCALE AGREEMENTS.

In making agreements with manufacturers it has been found most satisfactory, where practicable, to have the price of the finished articles purchased based on the average price of the raw material from which such articles are produced, as quoted say every three months in the most reliable trade journal, with the understanding that when the price of any finished article has once been agreed to, such price will thereafter automatically fluctuate in some fair proportion with the price of the raw material:

For instance:

The price to be charged for the following articles on orders placed by the Railroad Companies with the manufacturer during each quarter of any calendar year during the term of the agreement.	May be based with proper differentials on the average price of the raw material mentioned below, as quoted in the most reliable trade journal during the month or quarter immediately preceding the quarter of the calendar year in which the finished material is ordered.
Boller tubes, dry pipes, safe ends, water grates and arch pipes. Firebox steel. Castings, steel and malleable iron. Castings, gray iron. Steel or iron forgings, for locomotives, rough or finished. Rail joints. Stay bolt and boiler brace iron. Screw spikes. Track spikes. Track bolts and nuts. Wheels, rolled steel.	Average price per gross ton of Bessemer pig iron at Pittsburgh, Pa.
Brake-beams. Truck bolsters, if made of rolled steel.	Average price per 100 lbs. of beams and channels at Pittsburgh, Pa.
Axles, steel, for cars or locomotives.	Average price per net ton of steel forging billets at Pittsburgh, Pa.
Tie-plates, rolled steel.	Average price per gross ton of Bessemer steel billets at Pittsburgh, Pa.
Steel plates, merchant steel bars, steel angles, tees, channels and beams.	Average price per 100 lbs. of steel plates, merchant steel bars, steel angles, channels and beams at Pittsburgh, Pa.
Switches, frogs and crossings frogs, and repair parts for same.	Price of steel rails per gross ton f. o. b. Chicago, as quoted by the Illinois Steel Co., and price per 100 lbs. of steel bars at Pittsburgh, Pa.
Guard rails with adjustable clamp. Taper rails.	Price of steel rails, as above.
New cast-iron car wheels and credit to be allowed for scrap wheels.	Average price per net ton of scrap cast-iron car wheels f. o. b. Chicago.
Springs, elliptic and coil.	Average price per net ton of spring steel in 1,000 ton lots at Pittsburgh, Pa., as quoted by the Carnegie Steel Co.
Steel wire nails.	Average price per pound of steel wire nails f. o. b. Pittsburgh, Pa.
Wire: Barbed and plain; telegraph.	Average price per pound of plain fence wire f. o. b. Pittsburgh, Pa.
Box car metal roofs.	Average price per pound of galvanized iron sheets f. o. b. Pittsburgh, Pa.
White lead and red lead.	Average price per pound of refined corroding pig lead, in 50-ton lots at St. Louis, Mo., as quoted by the American Smelting & Refining Co.
Babbit metal. Car seals.	Average price per pound of desilverized refined pig lead in 50-ton lots at New York, as quoted by the American Smelting & Refining Co.
Journal bearings and brass castings and credit to be allowed for scrap brass, etc. Safety valves. Locomotive whistles.	Average price per pound of casting copper f. o. b. New York, as quoted on the New York Metal Exchange.
Gravity coppers.	Average price per pound of Lake copper at New York.
Gravity zincs.	Average price per pound of spelter at St. Louis, Mo.
Rubber insulated copper wire.	Average price per pound of Lake bar copper in 25-ton lots f. o. b. New York, and average price per pound of up-river fine Para new rubber, f. o. b. New York.
Manilla rope.	Average price per pound at New York of current spot manilla hemp and good current spot manilla hemp.
Creosote.	Average price of creosote as quoted in London, England.

These examples show how it is often practicable to make agreements between large consumers and producers, so that when mutually satisfactory prices have once been agreed to, some fair automatic method can be used whereby prices will adjust themselves to future conditions with as little unnecessary labor and friction as possible. Such a sliding scale basis mutually protects the purchasers and sellers, and in agreements extending over long periods

avoids disputes and arguments as to how prices should be fairly adjusted when general conditions change. For the protection of the railroads a clause is embodied in nearly all such agreements, stating that in case the manufacturer at any time quotes lower prices on similar articles to any of his other customers he will likewise reduce prices to the railroads mentioned as regards orders they may place with him during the months in which he may have made lower prices to any of his other customers.

About one-quarter of all the continuing agreements thus far made by the Director of Purchases have had prices based on a sliding scale.

AGREEMENTS BASED ON FIXED PRICES.

In many cases, especially those in which labor is very much the largest item of expense, it may not be practicable to base prices on any sliding scale. In such instances agreements are made with the manufacturers at the lowest fixed prices that can be arranged, and the clause referred to above is inserted whereby the manufacturer agrees that, should he quote lower prices to other customers, he will reduce his price correspondingly to the railroads mentioned.

CONTINUING AGREEMENTS.

In order to avoid unnecessary labor, the agreements have been made, in nearly all cases, to continue without expiring until a certain number of months' notice by the railroads to the manufacturer, or until two or three or more times as much notice to the contrary from the manufacturer to the railroads. In agreements covering patented devices, clauses have been inserted to protect the railroads as regards adverse claims that may be made on account of patents or royalties. As a rule, the railroads make such agreements to extend as long as they desire to use such patented devices as standard, reserving the right to cancel them by giving reasonable notice and to adopt other standards, if articles of sufficiently greater merit are offered to justify a change.

COMPANIES INCLUDED IN AGREEMENTS.

In making agreements between manufacturers and the Union Pacific, Oregon Short Line, Oregon Railroad & Navigation Company, and Southern Pacific Company, it has been customary to arrange so that any of the present or future associated or proprietary companies of any of the railroad corporations named may be considered a party to these agreements if so desired.

AGREEMENTS WHICH ARE PRACTICALLY QUOTATIONS FROM MANUFACTURERS.

At times large manufacturers have made propositions to the Director of Purchases, quoting very favorable prices and other terms at which they would be willing to furnish certain materials to any of the associated lines until six months or one year's notice from the manufacturer to the representative of the railroads to the contrary. In submitting these quotations, the manufacturers have fully described and illustrated, if necessary, exactly what they proposed to furnish. Where the Director of Purchases has felt it advisable he has accepted these propositions on behalf of the associated lines, with the understanding that such agreements do not in any way obligate the railroads, except as regards orders they may choose to place with the manufacturer. Copies of these propositions have then been forwarded to officials concerned for their information and files. It is customary to have only one such proposition, covering the same kind of material, in effect at the same time.

Some examples of articles covered by such agreements are:

Asbestos pipe covering, magnesia, lagging, etc.
Carbon paper.
Carriage and machine bolts, nuts and lag screws.
Glass.
Paint brushes.
Paper, roofing and building.
Patented flange unions, ellis, tees and other fittings.
Rivets, nuts and washers.
Tools, pneumatic; air compressors, air hoists, etc.
Varnish.

ARTICLES WHICH CAN BE PURCHASED LOCALLY TO JUST AS GOOD OR BETTER ADVANTAGE THAN BY A CENTRAL PURCHASING AGENCY.

Besides those above-mentioned, there is, of course, an immense variety of staple or miscellaneous materials and supplies purchased by the railroads for distribution to many different points, some of which articles it may not be especially important to describe by definite specifications, or to illustrate by detailed drawings. Such supplies are, for instance, groceries, hardware, pipe and fittings, machinery and tools, drugs, dry goods and a great many other kinds of miscellaneous material.

Many of these supplies are carried in stock by local jobbers, who buy them from the manufacturers in larger lots than the railroads would buy, and, therefore, often to better advantage, and who can obtain the benefit of carload rates of freight from point of manufacture, which the railroads might not receive. On bids received from time to time from local jobbers, who can usually ship promptly out of stock, such articles can ordinarily be purchased by local purchasing agents to as good or better advantage than a central purchasing agency could buy them direct from the manufacturers in small quantities. Where such conditions exist, it is, of course, preferable for the railroads to stimulate local business

by favoring the local jobbers, who probably ship freight over their lines.

Such supplies as fuel, lumber, timber, ties, fence posts, telegraph poles, piling, brick, lime, cement, etc., which form very large items of a railroad's consumption, can ordinarily be purchased by Local Purchasing Agents, or their representatives, from local sources to better advantage than they could be bought by any central purchasing agency for several different lines of railroad, if spread over a wide range of territory.

SUMMARY.

The examples previously mentioned refer to some of the different articles, which have been adopted as common standard by the various lines of the Union Pacific and Southern Pacific systems, the purchase of which has been covered by agreements made by one central purchasing agency. Based on these agreements, the local purchasing agents of each of the associated lines may place orders direct with manufacturers. As fast as the officials of the mechanical, maintenance of way or operating departments adopt additional articles as common standards, and prepare the necessary specifications and drawings, new agreements covering the purchase of these articles are made in the same way.

The most important items, have, no doubt, already been standardized and covered by such agreements, but this policy has proved so successful and satisfactory to all concerned that the list of common standards will constantly increase, and new agreements in regard to the purchase of these articles by the various lines will continue to be made, as long as the associated lines are allowed to co-operate in such matters. Such methods of intelligent co-operation benefit not only the railroads, but also the general public because they tend to establish more efficient, safer and more economical standards of railroad practice throughout the world.

The following remarks by I. O. Rhoades, General Purchasing Agent at San Francisco, of the Southern Pacific Company, Pacific System, indicate the methods which may be used by an individual railroad in ordering, receiving and disbursing material purchased in accordance with agreements and standards referred to above, and some further benefits derived from such practice:

"When copies of these agreements are received in the office of the local purchasing agent, an abstract of such information as it is desirable to furnish, including references, if necessary, to common standard schedules, material specifications and drawings, is sent to the heads of the departments ordering, receiving and using the articles in question. This information is then forwarded by the general storekeeper to each division storekeeper concerned, and by the latter to the foreman in charge of such material. These officials are thus advised in regard to proper description of the standards adopted.

"For the purpose of facilitating the ordering, receiving, storing and shipping of different materials, they have been classified under the following 21 headings, and instructions have been given that separate requisitions must be made when materials from different sections are asked for."

Sectional Arrangement of Material in Storehouses.

- | Section. | Description of Material. |
|----------|--|
| 1. | Maintenance of way material, steam shovel parts, hand car, motor car and velocipede parts. |
| 2. | Bolts, nuts, rivets, lag screws, washers, etc. |
| 3. | Sheet iron, brass, copper, zinc, lead, Eng. bars, springs, tubing, chain, wire rope, jack screws. |
| 4. | Boiler and firebox steel, steel tank ends, flues, pipe, bar iron, bar steel, piston rods. |
| 5. | Boiler lagging, pipe covering, nails, carbide, shovels, rope, building paper, wire staples, handles, etc. |
| 6. | Finished and rough brass, pig metals, etc. (Except journal bearings.) |
| 7. | Air brakes, lubricators, injectors, automatic sanders, steam heat equipment, Plintsch and acetylene gas material, electric head-light parts. |
| 8. | Car trimmings and fixtures, shelf and building hardware, small tools, metal piston and valve stem packing. |
| 9. | Water service material, pipe fittings, globe, angle and gate valves, etc. |
| 10. | Upholstering material, etc. |
| 11. | Glass, brushes, painters' supplies, paints in packages. |
| 12. | Belting, hose, packing, rubber and leather goods. |
| 13. | Station and train supplies, lamps, lanterns, chairs, glassware, tin-ware, etc. |
| 14. | Castings (rough iron and steel), except car castings. |
| 15. | Car castings and forgings, journal bearings, bolsters, brake beams, car trucks, car bolts, couplers and parts, train chains, stoves and parts. |
| 16. | Wheels and axles (mounted and unmounted) tires, centers, front ends, cylinders, etc. |
| 17. | Lumber, all kinds (rough and finished). |
| 18. | Fire clay, brick, cement, coke, charcoal, Smithing and Blossburg coal. |
| 19. | Oils, waste, grease, varnishes, candles, etc. |
| 20. | Signal, telegraph, telephone, interlocking and electrical material. |
| 21. | Scrap, all kinds. |

"A foreman is placed in charge of each section of material. When he orders, receives, cares for and issues material for his particular section, he becomes more of an expert on that class of material than if he, with others, attended to a greater variety of supplies.

"In order to have duplicate stocks at as few points as necessary for economy and convenience, it has been arranged to carry some classes of material only at certain stores. For example, track tools, signal, lighting and electrical material, piling, ties, lumber for track and bridges are carried on hand at West Oakland, Cal., for terri-

tory north of Tehachapi, and at Los Angeles for territory south and east of Tehachapi, instead of at every store on the Southern Pacific system. This systematizes and classifies the business, saves double hauling, handling and expense. A printed pamphlet has been distributed showing what divisions and what shops each store supplies, and to which storekeeper requisitions for certain kinds of material should be sent. This pamphlet also contains a list of about 1,000 different articles or kinds of material which may be asked for from time to time and shows what information should be furnished in ordering each of these, and whether they should be ordered by the pound, foot, ton, gallon, number, etc., and to what section of material, referred to above, they belong. A list of standard catalogues, to which frequent reference may be made on requisitions, is also given. In this manner much necessary detailed information is supplied to persons ordering, receiving and using material. This enables them to know how it should be described on requisitions, what names and references should be given and how it should be properly checked when received.

"Under the old system material was ordered in many different ways: Wire by the foot, pound, miles, bunches, coils, tons, etc. Other material would sometimes be ordered by feet, number of pieces, carloads; or again by gallons, pints, barrels, cans, etc. Nearly all material is now ordered in one way by the individual making the original requisition, and by the store and purchasing departments. Heretofore, there was not so much uniformity of names for the same articles as at present. One man would make a requisition giving a thing a certain name, while someone in another department would call it something else. In this way a large amount of time, labor, expense and correspondence was consumed by the store or purchasing department in endeavoring to ascertain exact details. Even after all this trouble, occasionally the wrong article would be shipped, only to be returned to the store department and the work repeated. Much of this was due to the fact that often no reference was given to a drawing or schedule, or to the exact type of car, engine or other device, for which the article was required. There were also so many different kinds of brake-beams, hand-cars, lubricators, car trimmings, switch lamps, tail lights, lanterns, bolsters, forgings of all kinds, etc., that there was frequent liability of error and often great delay in obtaining definite information for requisitions.

"Under the present system of adopting and maintaining definite standards, this labor is being reduced. The foreman in charge of each section of material, and others who handle requisitions know not only what the common standards are, but also how to order them properly and check them when received. Although the saving in labor and expense by such practice cannot be expressed in dollars and cents, it is easily apparent to those who handle the material in question.

"One of the greatest objections to constant changing or unnecessary varieties of standards on a railroad, is the fact that for nearly every standard introduced, more or less special extra parts must ordinarily be carried in stock for purposes of repairs. Thus, if a railroad has three or four different makes of hand-cars in service, it will be necessary for them to carry in stock repair parts worth two or three times as much as though they followed the policy of ordering only one make of hand-car in accordance with definite plans and specifications. It would be possible to cite many other similar examples of how the expense of maintaining many articles during their existence exceeded several times their original cost. The use of unnecessary varieties adds enormously to the amount of repair parts to be carried in stock at many points, and to the time such equipment or devices are apt to be out of use undergoing repairs.

"Before the adoption of common standards on the present extensive scale, foremen of different departments, following their own ideas or experiences, ordered many more classes and kinds of material than they do now. While one man would think a certain article was better than all others, another would think just the opposite; whereas, if a certain article is better on one division, all things considered, it should in most cases be entirely satisfactory and suitable elsewhere. For instance, at one time there were about 65 different kinds of packing furnished. This has now been reduced to 12. The indiscriminate purchase of many different kinds of equipment and other devices and supplies and the excessive amount of labor and expense involved in maintaining unsuitable and poorly chosen standards, is a matter to which most railroads could well afford to pay more attention than they have done heretofore.

"Many railroads find that they are constantly accumulating a large amount of material, which soon becomes obsolete and valueless except as scrap, although for some time they may carry it on their books at cost price. If more care is taken to maintain intelligent and definite standards, especially for articles purchased in large quantities, with the understanding that they will only be changed for good and sufficient reason, railroad companies will find that the accumulation of this obsolete material thereafter will be insignificant. At least such has been the experience of the Union Pacific and Southern Pacific."

GENERAL NEWS SECTION

NOTES.

The Chicago & North-Western has a gasoline motor car, leased from the Union Pacific, and is running it between Beloit, Wis., and Janesville, 14 miles.

The Pennsylvania Railroad announces that its Fifth avenue ticket office in New York City will henceforth be kept open until 10 p.m., including Sundays.

At White Plains, N. Y., last Monday, a jury brought in a verdict of \$32,400 in favor of a woman who was injured in the derailment of the New York Central at Williams Bridge, in February, 1907.

A summary of 1,258 surprise tests on the Union Pacific and Southern Pacific for the month of March shows an efficiency percentage of 98.8 for the enginemen. The violations were not of a kind that would have caused serious accidents.

President Roosevelt has signed the Employers' Liability bill, which was passed by congress, April 9 (*Railroad Gazette*, April 17, page 552). Attorney-General Bonaparte advised the President that the bill was a sound one, having decided that it does not contain unconstitutional features, as had been asserted.

The Duluth, Rainy Lake & Winnipeg is to establish a through freight route between Duluth and Winnipeg. It will be over the Duluth, Missabe & Northern to Virginia, from that point to Ranier, over the Duluth, Rainy Lake & Winnipeg and from the Canadian boundary to Winnipeg, over the Canadian Northern. The bridge at Ranier, over the Rainy river, is about finished.

The New York State Court of Appeals has decided in favor of the New York City Railway a suit in which that company was prosecuted for a penalty for refusing to give a free transfer to a passenger who had paid a five-cent fare. The law requires the company to carry, for a single fare, to any point on its line, every passenger who boards its cars; but in this case the passenger rode south on Third avenue, westward on Chambers street, and then north on West Broadway; and the court sustains the company in limiting the transfer privilege to a continuous trip in one general direction.

By the extension of the Manhattan (New York) subway to Flatbush avenue, Brooklyn, the opening of which is announced for May 1, Jamaica, N. Y.; Garden City, Hempstead and other towns in that vicinity are brought within 35 to 45 minutes of Trinity Church—that is to say, of the corner of Broadway and Wall street, Manhattan. The extension of the subway under the East river, from Bowling Green to the Brooklyn Borough Hall, which has been in operation for the last four months, is now finished about three-quarters of a mile further to a connection with the Long Island Railroad, and is to be opened as before stated. Between the Flatbush avenue terminal and Jamaica, 10 miles, the Long Island Railroad is a four-track electric line, traversed by frequent trains, and by May 15 it is expected that the electric service will be extended to Hempstead, 10 miles beyond Jamaica.

Place Names on the North-Western Line.

A history of the origin of names of places in the states through which the Chicago & North-Western and the Chicago, St. Paul, Minneapolis & Omaha pass has been compiled by one "who for more than 34 years has been an officer in the employ of this company." Great pains have been taken to get all the information that the oldest inhabitants had in regard to the origin of names of the towns and cities, but the compiler has, as he tells us, ruthlessly disregarded local legends and travelers' stories. "While it is true that the investigations of the writer have shattered many pretty romances, it is not unlikely that others have escaped his notice and may yet be handed down as history." The most interesting feature in the history of place names, especially those with Indian origin, is the evolution of the spelling. Wyoming is a corruption of the Delaware Indian word Maugh-wa-wa-ma, meaning large plains. Chicago has been spelled Tzschago, Psceschaggo and Tschakka. It is thought to have meant river of garlic. Wherever possible the writer has given a short account of places historically interesting.

Control of Coal Mines in Oklahoma, Utah and Wyoming.

The Interstate Commerce Commission has reported to the Senate, pursuant to a joint resolution adopted on March 7, 1906, on alleged discrimination and monopolies in coal and oil. The report is the third on this subject. It affirms that the coal supply of Oklahoma, Utah and Wyoming is almost entirely in the control of a some-

what complex monopoly, consisting primarily of the Pleasant Valley Coal Company, which is owned by the Utah Fuel Company, a New Jersey corporation, with a capital of \$10,000,000, this being owned in turn by the Rio Grande Western Railway, which is itself owned by the Denver & Rio Grande. All these roads are part of the Gould system.

The report charges that extensive frauds have been perpetrated by the Pleasant Valley Coal Company to acquire coal lands, which have been entered upon by "dummy" entrymen, and that the company has thus obtained all the coal lands worth having in its vicinity. Of 109 coal land leases in Oklahoma, 58 were controlled by railroads, and it is declared that the railroads, through the manipulation of cars and other methods, forced all the owners of leases into a combination known as the McAlester Fuel Company. As a result of this combination the price of coal in Oklahoma City, 120 miles from the mines, was forced up to \$7 and \$7.50 a ton. It does not appear that the officers of the Union Pacific Railroad have ever been personally interested in the development of any coal property, or that they have ever benefited from operations in coal along the line of that road, but the Union Pacific Railroad Company does absolutely dominate the mining, transportation and selling of coal along its line.

Chicago Agreement Under the 16-Hour Law.

Following is the agreement made at Chicago, April 19, between the general managers of thirty-two western railroads and representatives of the brotherhoods in the matter of interpreting the 16-hour law. The roads entering into the agreement are all those leading west from Chicago (except the Chicago Great Western and the Wisconsin Central) and the Illinois Central, the Missouri Pacific, the Northern Pacific, the Union Pacific, the Texas & Pacific and those allied with these.

Article 1. Under the laws limiting the hours on duty, crews in road service will not be tied up unless it is apparent that the trip cannot be completed within the lawful time, and not then, until after the expiration of 14 hours on duty under the Federal law, or within two hours of the time limit provided by state laws, if state laws govern.

Art. 2. If road crews are tied up in a less number of hours than provided in the preceding paragraph, they shall not be regarded as having been tied up under the law, and their services will be paid for under the individual schedules of the different roads.

Art. 3. When the road crews are tied up between terminals under the law, they shall again be considered on duty and under pay immediately upon the expiration of the minimum legal period off duty applicable to the crew, provided, the longest period of rest required by any member of the crew, either eight or ten hours, shall be the period of rest for the entire crew.

Art. 4. A continuous trip will cover movement straightaway or turn around, from initial point to the destination train is making when ordered to tie up. If any change is made in the destination after the crew is released for rest, a new trip will commence when the crew resumes duty.

Art. 5. Road crews tied up under the law will be paid the time or mileage of their schedules from initial point to tieup point. When such crew resume duty on a continuous trip they will be paid miles, or hours, which ever is the greater, from the tieup point to the next tieup point or to the terminal. It is understood that this article does not permit crews to be run through terminals unless such practice is permitted under their schedules.

Art. 6. Road crews tied up for rest under the law and then towed or deadheaded into terminal, with or without engine or caboose, will be paid therefor, as per Art. 5, the same as if they had run the train to such terminal.

Art. 7. If any service is required of an engine crew, or if held responsible for the engine during the tieup under the law, they will be paid for all such service.

Art. 8. The foregoing articles constitute an agreement for the above-named companies and their conductors, trainmen, engineers and firemen as to runs that are tied up in conformity with the law, and become a part of the schedules or agreements of these roads and subject to their provisions as to amendment by mutual consent. Nothing herein contained shall be construed to amend or annul any rule in the various agreements with individual roads.

Disastrous Collision at Maltrata, Mex.

Press despatches of April 25 report a butting collision between a freight train and an excursion passenger train, on the 24th, on the Mexican Railway, near Maltrata, Mex., in which 28 persons were killed and 15 seriously injured.

Passenger Earnings Under Two-Cent Fares.

The annual report of the Cincinnati & Muskingum Valley for the year ended December 31, 1907, just issued, makes the following statement in regard to passenger earnings for that year:

"The passenger earnings were \$184,876, an increase of \$2,546, or 1.40 per cent. The number of passengers carried decreased 17,181, or 2.95 per cent., with an increased passenger mileage of 242,615 miles, or 2.82 per cent., and a decrease in passenger train

mileage of 1.15 per cent. The earnings per passenger mile were 2.05c. caused by an increase in the mileage of passengers carried under the two-cent maximum rate, as compared with the previous year, the new law being in effect only during the last nine months of 1906. The expenses per passenger per mile were 2.92c., an increase of .03c., due to increased rate of pay and increased cost of materials. There was a consequent loss per passenger per mile of .87c., an increase of .05c."

This should be compared with a similar statement for the Grand Rapids & Indiana, which was published in the *Railroad Gazette* of April 17 page 527.

Shaw Wrecking Crane.

The 100-ton steam wrecking crane shown in the accompanying photograph was recently built by the Shaw Electric Crane Co., Muskegon, Mich., and sold through Manning, Maxwell & Moore, New York, to the Illinois Central. An important feature in the design is the location of the engine, the cylinders being placed well back toward the rear, instead of toward the front of the crane. The piping is thus short and direct and is out of the way of the machinery and the engineer. The steam pipe branches at the throttle, the pipes passing down at each side, just in front of the coal bin and the water tank, to the engine cylinders. The exhaust pipes go back underneath and then up to the separator on the back of the boiler, from which the exhaust steam passes to the stack through tubes inside of the boiler. These pipes are thus entirely out of the way and are protected from shocks that may cause deflection, and from the vibration of that part of the frame carrying the boiler. This position of the engine makes it possible to put the side frames farther apart and keep the machinery low, so that the center of gravity is lower; also, the engineer can get a good view of the work without being in a dangerous position. The passage for the engineer to and from the cab on both sides is unobstructed.

In addition to the usual hand brakes on the main and auxiliary hoists, steam brakes are also used on them. The auxiliary hoist has 20 tons capacity using a single line, and 40 tons with one sheave. Parts of the main and auxiliary hoists are interchangeable; these include: clutches, all brake parts, gears, shafts, drums and ropes. The design of the jib is different from past practice. The combination of bending and compression strains is avoided and the structure is lighter and stiffer. The engines are provided with the Walschaerts valve gear. Features of the steam generator are: forced draft, telescoping stack, shaking and dumping grates and dumping ash pan. The boiler tubes are so arranged that the crown sheet may be easily cleaned. There is a dry pipe, and particular attention has been paid to getting dry steam under the worst conditions.

The crane is self-propelling, one axle of each truck being driven by gears in such a way as not to interfere with the free movement of the truck. There is friction drive in the gearing to compensate for unequal diameters of wheels. The center and side bearings are self-lubricating, so that the crane can take sharp curves without the danger of derailment which is common on self-propelling cranes when there are rigid pedestals carried by the car body. Since the car is driven from both trucks, it travels equally well with the load suspended at either end. The car is equipped with both automatic and straight air brakes, the pipe connections from crane to car being permanent. The machine is mostly steel, very little cast iron being used.

Atlanta, Birmingham & Atlantic.

The Atlanta, Birmingham & Atlantic is carrying on important improvement work at Brunswick, Ga., where it is building and equipping freight and steamer terminals. The land for the steamer terminals it has reclaimed from the marshes, and these terminals are said to be unequalled on the South Atlantic coast for modernness and facility of loading and unloading vessels. The railroad controls the Brunswick Steamship Company, which has recently put into commission five new freight steamers running between Brunswick and New York. These steamers are built of steel and designed especially for the trade, with their engines aft to facilitate lumber loading. The Atlanta, Birmingham & Atlantic is now said

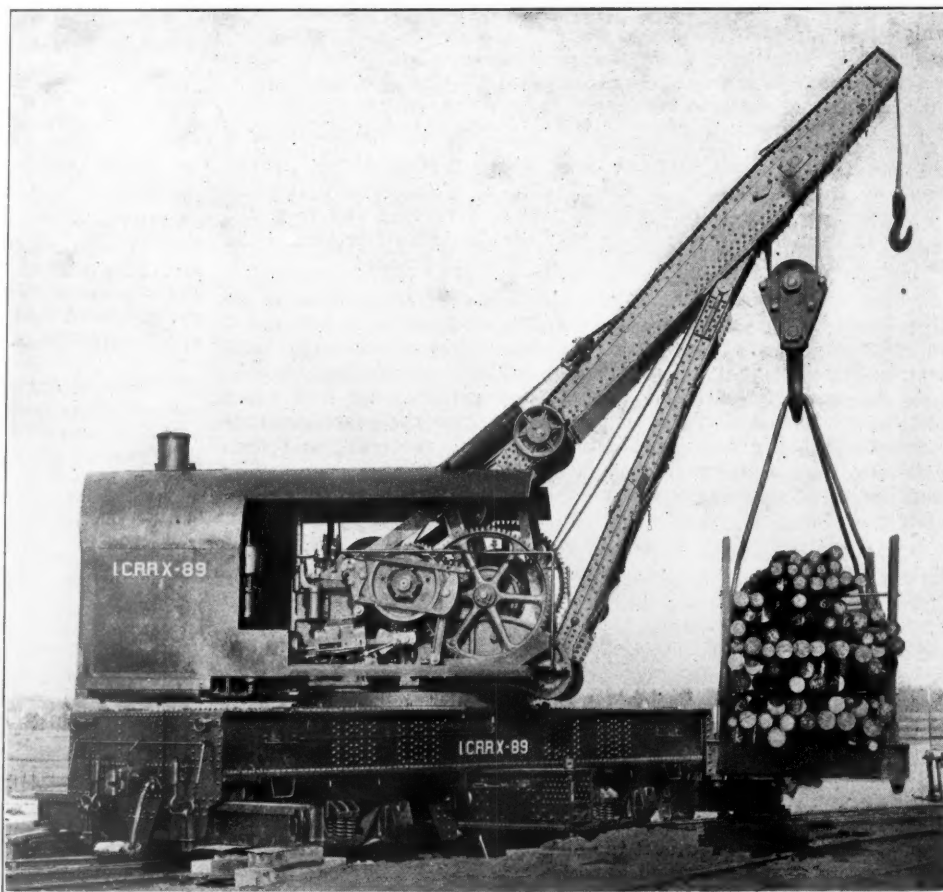
to have the largest lumber business of any road in the South, and it also touches the heart of the cotton country and owns important coal and iron mines. H. M. Atkinson is president both of the railroad company and of the steamship company.

Thor No. 9 Close-Quarter Air Drill.

The "Thor" No. 8 close-quarter piston air drill, made by the Independent Pneumatic Tool Co., Chicago, was described in the *Railroad Gazette* of Jan. 25, 1907. This drill, which can work within $1\frac{1}{2}$ in. of a corner, can drill up to 2 in. in diameter and can ream and tap up to $1\frac{1}{4}$ in. in diameter. To meet a demand for a similar machine for heavier work, a No. 9 machine has been produced, with dimensions as follows:

Distance, throttle connection to outside of spindle case.....	15 3/4 in.
Distance, point of feed screw to end of socket.....	8 7/8 "
Radius from center of feed screw to outside of case.....	1 7/32 "
Width of case at cylinder flanges.....	5 3/16 "
Width of case at spindle.....	6 1/4 "
Weight.....	31 lbs.
Speed.....	122 r. p. m.

The spindle is at one end of the tool and the motor at the other. The motor consists of two parallel cylinders at right angles to the



Steam Wrecking Crane; Shaw Electric Crane Company.

spindle, with their center line on the center of the spindle. The pistons are double-acting and work a two-throw crank. The eccentrics are between the crank arms, the whole being one forging. The eccentrics drive balanced cylindrical piston valves, having a reciprocating motion. The air is taken in centrally between the cylinders, and the clearance between valves and cylinders is the least practicable. Geared to the crank shaft is another two-throw crank, diametrically opposed. This crank works two oscillating levers centered on the drill spindle, with their bearings around the same. These levers are provided with pawls, of about the full thickness of the lever, which work on ratchet teeth sunk in the spindle. The outer circumference, or points of teeth, leaves ample stock for the bearings of the levers. The lever-moving crank has its power stroke on the part of the revolution farthest away from the spindle. This causes a more uniform speed of the lever, with a forward pull considerably more than half a revolution, and a quick return to action. The crank being opposed, the motion of the drill spindle is practically continuous. The engine crank is not on the usual 90 deg. angle, having instead an angle of 135 deg., thus allowing both pistons to pull when the position of the levers requires the greatest power. The drill is thus partly self-regulating, with a tendency to still further govern the speed of the full revolution of the spindle. The drill has a reversible-ratchet feed mechanism, working within the width of the body of the drill. The speed and power are controlled by a poppet-valve throttle, which also acts as a handle.

INTERSTATE COMMERCE COMMISSION RULINGS.

Through Routes and Joint Rates.

Cardiff Coal Co. v. Chicago & North-Western et al. Opinion by Commissioner Harlan.

A state of facts similar to that in the case of Cardiff Coal Co. v. Chicago, Milwaukee & St. Paul et al. (see below) appeared, and the Commission declared that complainant is entitled to an order establishing through routes and joint rates to all strictly local points on the line of the Chicago & North-Western to which no through routes now exist from Cardiff.

Cannel and Bituminous Coal.

Goff-Kirby Coal Co. v. Bessemer & Lake Erie and Butts Cannel Coal Co. v. the same carrier. Opinion by Commissioner Prouty.

It was held that where the carrier has a rate on bituminous coal it should apply that rate to cannel coal. The Commission said that there is nothing in the physical attributes of cannel coal to distinguish it from bituminous coal proper; indeed, it appeared that one mine on the line of the defendant had been shipping cannel coal as bituminous without the knowledge of the defendant. The questions of reparation raised in these cases are reserved, but the Commission declared that it does not follow that because a rate is reduced for the future, damages will be allowed in all cases where that rate has been exceeded in the past.

Differentials to Wichita.

Johnston & Larimer Dry Goods Co. and Cox-Blodgett Dry Goods Co. v. Atchison, Topeka & Santa Fe and 187 other carriers. Opinion by Commissioner Prouty.

It was held that rates on cotton piece goods from Atlantic seaboard territory to Wichita, Kan., via Galveston, Tex., should not exceed \$1.25 per 100 lbs. This recognizes a differential of 32 cents against Wichita, which under normal conditions and on the present basis of rates ought not to be exceeded. The Commission further held that the present rate on knit goods from Atlantic seaboard territory to Wichita via Galveston of \$1.64½, producing a differential against Wichita of 26½ cents, is not unjust nor unreasonable. The order in this case was issued against only those defendants which operate via Galveston.

Jurisdiction Within Oklahoma.

Chandler Cotton Oil Co. v. Fort Smith & Western. Opinion by Commissioner Clark.

The complaint involved reasonableness of rates on shipments of cotton seed over defendant's line from Prague, Okla., to Warwick, but it was dismissed for want of jurisdiction, following the decision of the Commission in the Hussey case.

The Commission said that in all controversies before it if there is lack of jurisdiction, either from the absence of essential facts or through want of power in the statute, it is the duty of the Commission, on its own motion, to deny jurisdiction. The provision of the Act to regulate commerce applying to carriers transporting property "from one place in a territory to another place in the same territory," so far as it related to the territory of Oklahoma, expired by its own force on November 16, 1907, when Oklahoma was admitted as a state.

Rates on Live Stock from the Southwest to Chicago.

Cattle Raisers' Association of Texas v. Missouri, Kansas & Texas and 57 other carriers. Opinion by Commissioner Prouty.

The conclusions announced by the Commission in its opinion of August 16, 1905, in this case are affirmed, and the rates therein pronounced excessive are held to be still excessive and unreasonable. The rates on live stock prescribed to Chicago from the southwest are held to be sufficient to carry a delivery at the Union Stock Yards, and the imposition of any terminal charge in excess of \$1 is declared unreasonable; but reparation was allowed only from August 29, 1906, when the complainant presented its petition for further proceeding under the amended Rate Law.

These advances were made during the year 1903 and were generally 3 cents per 100 lbs. In a few cases they were as high as 5 cents and as low as ½ cent. It is evident that in such instances it was the purpose of the carriers to change the relation in rates. Presumably the old relation was wrong in the opinion of the carriers and the present relation is right. If the Commission were simply to order a reduction to the original basis the present relation would be disturbed in these instances, and yet the Commission cannot well make any different order since these rates have not been specifically referred to. The better way seems, therefore, to be to allow the carriers sufficient time within which to put in rates in substantial accord with this report, and the making of an order

will be postponed until July 1, 1908. The questions as to reparation are reserved and will be dealt with as specific claims are presented. Chairman Knapp filed a dissenting opinion in this case.

The Statute of Limitations.

Missouri & Kansas Shippers' Association v. Atchison, Topeka & Santa Fe, Missouri Pacific (two cases), and Kansas City Bell. Opinion by Commissioner Harlan.

The four complaints were dismissed. The findings of the Commission were:

"A complaint by a voluntary association demanding reparation under general averments which do not name the members on whose behalf it is filed and do not with reasonable particularity specify and describe the shipments as to which the complaint is made, does not operate to stop the running of the period of limitation provided in the law; and does not give the members of the association the opportunity subsequently to come in and take advantage of the complaint by proving up their shipments, which would be barred of relief upon separate and individual complaints if then filed by themselves.

"A statute of limitations is a wise method of forcing claimants either to assert their rights against others or definitely abandon them. Persons against whom claims may be made are fairly entitled to repose at some definite point of time, and this is especially true in connection with matters of transportation. Waybills and other papers accumulate in vast numbers in the course of a few months, and carriers are entitled, if claims are to be made, to have them made with reasonable promptness.

"The universal rule in the courts, also applicable to the Commission, seems to be that, under a system of pleading which permits a proceeding for damages to be instituted by filing a complaint, the statute of limitations does not cease to run against the demand until the complaint has been filed setting up the claim with sufficient particularity to make an issue. Until a definite cause of action has been pleaded there is nothing to arrest the running of the statute. All the elements fairly necessary to present the cause of action must be pleaded in a complaint filed with the Commission.

"Under Section 13 of the Rate Law a carrier has a definite *locus penitentiae* in order to determine whether it will yield to the demand made or contest it; and the carrier has the right to have the complaint so stated as to afford it the necessary information to enable it to determine whether to request the authority of the Commission to satisfy the demand or to make a formal answer. When the demand is made on behalf of unnamed shippers and on shipments that are not specified with reasonable particularity, this opportunity is not open to the carrier."

Distribution of Coal Cars Where Carrier's Coal Is Involved.

In the cases of Royal Coal & Coke Company, Tennessee Coal Company and Minersville Coal Company against the Southern Railway, rendered by Commissioner Cockrell, the Commission held that the only regulation in respect to the transportation of coal from mines that is just, fair and reasonable is to allow to each mine its fair and just proportion of the coal cars, estimated upon its justly ascertained capacity, and without regard to whether the mine furnished partly fuel coal for the carrier and partly commercial coal, or commercial coal only.

The Commission further decided that the carrier should publish or post for convenient inspection, at frequent and regular intervals, the rating of the various mines and the car tonnage received by them within the period covered by the report. In cases where commercial mines have received more or less than their equitable pro rata of the car tonnage during any particular period, the over-plus or shortage for such mines should be adjusted, as far as possible, within the period next succeeding, and such correction should be shown in the subsequent reports. The carrier must be free to contract for the total output of the mine, if it so desires; or it may contract for any part thereof less than the whole; and it is entitled to get its fuel first. If, however, a mine contracts to furnish only a part of its output to the carrier for fuel, and if the filling of its contract with the carrier calls for its full pro rata of cars, or more, then it should receive no other cars for commercial shipments. If such a mine in filling its contract to supply fuel coal does not exhaust its equitable pro rata of cars, then cars should be given to it for commercial shipments sufficient to complete its full pro rata share of all available cars.

In the case of Traer, receiver of the Illinois Colliery Company against the Chicago & Alton, the same complainant against the Chicago, Peoria & St. Louis, and the same complainant against the Illinois Central, rendered by Commissioner Clark, the defendants claim that the necessity for fuel with which to operate their lines gives them the right to make private contracts therefor, and that the failure to count against the mines the cars furnished for such fuel supply permits them to make advantageous contracts and to

get their coal at a lower price, and that if they counted their own fuel cars in the distribution they would not only have to pay a higher price for their coal, but might not be able to contract for it at all.

The Commission held that fuel is necessary and essential to the operation of a railroad, and the right of a carrier to contract for the purchase of its fuel supply with one mine or with a number of mines must be conceded; but if a carrier and a mine owner make a contract for the fuel supply of the carrier which does violence to the act to regulate commerce or to the decisions of the court or is opposed to public policy they are in no better position than the parties to any other contract which violates the legal principles relating thereto. A carrier cannot inject illegalities in such contract and have it upheld on the ground of compelling necessity.

In these cases the Commission is of the opinion that as to the privately owned or leased cars and the foreign railroad fuel cars the rule laid down by the Commission in the Railroad Commission of Ohio case should apply, and that cars used by defendants upon their own lines for transportation of their own necessary fuel supply may be given in any numbers to the mine or mines from which such fuel supply is received, but if such mine or mines also ship commercial coal the fuel cars so supplied must be counted against the mine or mines.

Right to Through Routes and Joint Rates.

Cardiff Coal Co. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Harlan.

The complainant formerly was allowed through routes and joint rates from its mines to certain interstate points, but subsequently this privilege was withdrawn. Complainant's daily capacity is in excess of the requirements of the local markets, and the complaint is filed for the purpose of securing a wider market. While such through routes and joint rates were in force, complainant was able to sell coal to the interstate territory in question, but since such withdrawal the greater part of this trade has been lost. While denying to complainant such an outlet from its mines, through routes and joint rates are maintained to such interstate points from other nearby mines. On petition of complainant for an order re-establishing the through routes and joint rates, the Commission held that the routes over other lines referred to in the opinion are not reasonable or satisfactory; that complainant should again be accorded the through routes and joint rates, and that the refusal to establish through routes and joint rates from complainant's mines is an unlawful discrimination.

The Commission further held that an interstate carrier, in order to build up enterprises of the same character on its own line and to prevent the trade of its local industries from being displaced by the competition of manufacturers of the same commodities on connecting lines, cannot deny to industries on the lines of such connections the benefit of through routes and joint rates; nor is the fact that the revenues of the carrier may be reduced by establishing such through routes and joint rates a material consideration. It may be laid down as a general rule admitting of no qualification that a manufacturer or merchant who has traffic to move and is ready to pay a reasonable rate has the right to have it moved and to have reasonable rates established, regardless of the fact that the revenues of the carrier may be reduced by reason of his competition with other shippers in the distant markets; and he has the right also to have the benefit of through routes and joint rates to such distant markets if no "reasonable or satisfactory" through routes already exist.

Express Rates Between Denver and Missouri River.

George J. Kindel v. Adams Express Co. et al. Opinion by Commissioner Prouty.

The complaint alleges that express rates from New York, St. Louis and Omaha to Denver are unreasonable; that the rates between Denver and San Francisco and Salt Lake City are unreasonable; that the rates to Denver made by combination on the Missouri river from eastern points work unjust discrimination against Denver; and that the graduate scale of rates is unscientific and inconsistent. The Commission held that the base rates of \$4 per 100 lbs. from Omaha to Denver and of \$4.25 per 100 lbs. from Denver to Ogden should not exceed \$3.50 and \$4 respectively. Further, that the rates made by express companies on small packages in competition with the United States mail are not to be taken as standards by which to determine the reasonableness of their rates on larger packages. In making express rates, a base rate of so much per 100 lbs. was fixed, and to that is applied what is termed a "graduate" scale, giving the rates on smaller packages for a given base rate. All the defendants use the same scale, which was attacked by the complainant as "illogical and inconsistent." The only objection pointed out was that rates on small packages did not correspond with those on larger ones, which is due to competition with the mail in carrying small packages. The scale must be assumed to be a

reasonable one in this proceeding, and the only inquiry as to the reasonableness of rates involved should be directed to the reasonableness of the base rate. The fact that express rates in and out of a particular business locality are higher than those in and out of a competing locality from a common source of supply is not of the same importance as in the case of freight rates, since the wholesaler ordinarily brings his merchandise in by freight and also distributes it by freight.

Within certain limits express rates and freight rates compete and to that extent express rates should be established with reference to freight rates. The main object of an express service is expedition, and express rates should not be so low as to attract business which might properly go by freight and thereby congest and interfere with the service by express. In determining the reasonableness of express rates little reference can be had to the value of the property employed, since the connection between the value of the service and the cost of the property employed in rendering it is slight. This is equally true of the capitalization of the defendants, which bears no relation whatever to the actual investment necessary to conduct the business. In determining whether the present charges of the defendants are reasonable, inquiry must be had into the character of the business, the amount of capital required for its conduct, the hazard involved, and especially the profits which these companies are now making under the rates attacked.

Since no reliable information as to results of operations of these defendants under existing rates was presented, no opinion was expressed as to the reasonableness of their rates in general. The inquiry is confined to rates in territory west of the Missouri river to and from Denver. A comparison of express rates in one locality with those in another is of a much greater value than a similar comparison between freight rates, since the character of the business and the conditions under which it is transacted are more nearly the same. Rates from eastern destinations to Denver are made by adding together rates to the Missouri river and from the Missouri river, and applying to the resulting base rate the graduate scale. The rate on small packages thus obtained is much less than the sum of the locals on the same package to and from the Missouri river and is somewhat less on packages up to 50 lbs. in weight. The great majority of packages handled are under 50 lbs. This method of making through rates is not unlawful, for while the rate on packages weighing 50 lbs. and over may be somewhat high, the total result is reasonable.

The practice of making rates from or to an exclusive office by combination of the full local rates through some junction point seems to be objectionable, but since there is not evidence in this case from which the effect of an order requiring the establishment of a through base rate and the application of the graduate scale to that rate can be determined, the Commission declines to interfere with the present practice at this time. The fact that under the postal regulations of England a package can be sent from London to Denver for 50 cents is no reason for pronouncing an express rate of 70 cents on a package of the same size from Denver to London unreasonable.

TRADE CATALOGUES.

Wire Rope, Insulated Wire and Cables.—Two pamphlets, 156 pages together, issued by the Hazard Manufacturing Co., Wilkes-barre, Pa., deal with wire rope and insulated wire. Section 1 gives sizes, weights, strength and prices of iron, steel and galvanized wire rope, wires and appliances connected with the use of wire rope. This is illustrated with a large number of photographs, showing the different styles of rope and cable, and of buildings, conveying and hoisting machinery, inclined planes, etc. The pamphlet gives tables and other information on such points as: tension on rope under varying loads and on inclined planes of different degrees, proper working loads on cables, amount of power transmitted by wire rope under different conditions, etc. Section 2 gives correspondingly full information concerning insulated and uninsulated wires and cables.

Chains.—Catalogue No. 75, of the Link-Belt Co., Philadelphia, Pa., fully illustrates, with brief descriptions, the Ewart detachable link belt, showing sizes, weights, strength and prices with various attachments. It also describes pintle chains, or chains whose links are connected with pins or rivets. These include chains of many styles for different uses. Roller chains, mono-bar chains, and the Renold silent chain gear are also described, as well as sprocket wheels and spiral gears, bevel gears, angle gears, worm gears, equalizing gears and clutches for use on sprockets. Catalogue 78 of the same company is a small pamphlet telling how and why to use the Ewart link belt. It is illustrated with line drawings showing the points involved.

The Maine Woods.—The Bangor & Aroostook has issued the 1908 edition of *In the Maine Woods*, a "vacationist's guide." This is a volume 9 x 6 in., with 128 pages of reading matter and photographs,

and 65 pages of advertisements. Many of the photographs are exceedingly good, especially those which illustrate the fishing and hunting of the Maine woods. There are a number of pictures of wild deer and moose. There is full information about the various regions reached by the Bangor & Aroostook, the game, fishing and guide laws and maps of the various regions. Many of the advertisements set forth the hotels or camps available for visitors. The industrial development of northern Maine is also briefly described. The book is in all respects one of the best of its kind.

Boilers.—Catalogue No. 60, of the Murray Iron Works, Burlington, Iowa, describes the construction of the Murray water tube boilers. It is illustrated with many halftones of boilers and details, and of buildings in which they have been installed. They are designed for 160 lbs. working steam pressure, and are built in sizes from 50 to 500 h.p. They are rated, in general, on a basis of 10 sq. ft. of heating surface per horse-power.

Thermit.—A recent pamphlet issued by the Goldschmidt Thermit Co., New York, consists of shop instructions for the use of thermit in repair work. It shows the styles and sizes of molds for different jobs, and gives the prices of apparatus for making repairs. The repairs described include locomotive frames, driving wheels, connecting rods, motor cases, and flaws in castings and forgings.

Signals.—A catalogue of the Union Switch & Signal Co., Swissvale, Pa., fully describes, with price lists, a.c. block signaling appliances. It is illustrated with halftones and line drawings of separate devices, and diagrams of signal layouts. Bulletin 33 is a reprint from the *Railroad Gazette* of January 17, 1908, describing the a.c. automatic block signals on the New York, New Haven & Hartford.

Fan Motors.—Bulletin No. 4,560, of the General Electric Co., Schenectady, N. Y., describes a number of different styles and sizes of direct and alternating current fan motors, including ceiling fans, column fans, wall fans and exhaust fans. The bulletin also illustrates a number of small motors of from 1 to 30 h.p. for various uses.

Motors and Generators.—Pamphlet No. 226 of the Sprague Electric Co., New York, is an instruction book covering the installation and care of belted round type d.c. motors and generators. It is illustrated with halftones and line drawings of machines and parts. It also gives a number of wiring diagrams.

Locomotive Cranes.—Pamphlet K of the Brown Hoisting Machinery Co., Cleveland, Ohio, briefly describes, with a number of photographs and drawings, locomotive cranes for handling coal or ashes, etc. They are, as a rule, equipped with Brown patent grab buckets, which are also described.

Roofing.—A circular issued by the H. W. Johns-Manville Co., New York, calls attention to the advantages of J-M asbestos roofing, and also to a less expensive roofing known as the J-M-Oid. The latter is made of wool felt saturated with a water-proofing compound.

Brake-beams.—A folder issued by the Pennsylvania Brake-Beam Co., Danville, Pa., shows views of standard brake beams and standard I beams, and special reinforced brake-beams for heavy freight service.

MANUFACTURING AND BUSINESS.

J. A. Venable has been appointed General Manager of the New York Car Wheel Co., Buffalo, N. Y.

T. Kennard Thomson, Consulting Engineer, has moved to the Hudson Terminal buildings, 50 Church street, New York.

The offices of the Railway Steel-Spring Co., New York, have been moved to the Hudson Terminal buildings, 30 Church street.

The offices of the Atlantic Equipment Co., New York, have been moved to the Hudson Terminal buildings, 30 Church street.

The offices of the U. S. Metal & Manufacturing Co., New York, have been moved to the City Investing building, 165 Broadway.

The New York office of the Bettendorf Axle Co., Chicago, has been moved to the Hudson Terminal buildings, 30 Church street.

The New York office of the Union Spring & Manufacturing Co., Pittsburgh, Pa., has been moved to the Hudson Terminal buildings, 50 Church street.

The New York office of the American Brake Shoe & Foundry Co., Mahwah, N. J., has been moved to the Hudson Terminal buildings, 30 Church street.

The Canadian sales office of the National Malleable Castings

Co., Cleveland, Ohio, has been moved to 716 Canadian Express building, Montreal, Que.

Isham Randolph, Consulting Engineer, Chicago, has moved his offices from the American Trust & Savings Bank building to the First National Bank building.

W. B. Crane, Sr., of W. B. Crane & Co., Chicago, dealers in hardwood lumber, died in Memphis, Tenn., on March 28. The business will be continued as heretofore.

The offices of the Eppinger & Russell Co., New York, dealer in yellow pine lumber and ties, creosoted lumber, ties and piles, have been moved to the City Investing building, 165 Broadway.

The New York offices of the General Electric Co., Schenectady, N. Y., have been moved to the Hudson Terminal buildings, 30 Church street. The entire seventeenth floor will be occupied by these offices.

H. H. Sessions, who, as noted in this column last week, has been made President of the American Car & Equipment Co., Chicago, a car repairing company, remains also Vice-President of the Standard Coupler Co., New York.

Among recent orders received by the Alexander Milburn Co., Baltimore, Md., was one for a number of lights for the United States Reclamation Service and one for a special 5,000 candle power light for an 85-ft. revolving derrick recently built for the Great Lakes Construction Co., Buffalo, N. Y.

The firm of Wood & Van Nest, 26 Cortlandt street, New York, has been formed to represent manufacturers of railroad materials. M. F. Wood has been for many years General Manager of the Eyeless Tool Co., Newark, N. J., and J. A. Van Nest served on the Pennsylvania Railroad for a long time. The firm is prepared, as sales agents, to quote on all materials used in the roadway department.

Ten Westinghouse turbo-electric generators, aggregating 25,000 h.p., are being shipped, or will soon be shipped, to the far East. Most of these machines will go to Japan. One, a 1,500 k.w. turbine unit, is for the Manila Electric Railway & Lighting Co., where four similar machines are in service. The large turbine station of the Osaka Electric Co., Osaka, Japan, now building, will have, for the present, 15,000 k.w. in five units. The remaining four units will be installed in a steel plant and in a ship building yard in Japan.

The Canadian Crocker-Wheeler Co., Ltd., has been organized for the manufacture and sale in Canada of the apparatus made in the United States by the Crocker-Wheeler Co., Ampere, N. J. F. E. Lovell, President of the new company, is a member of the lumbering firm of H. Lovell & Sons, Coaticook, Que. Russell A. Stinson and F. J. Bell, Vice-President and Secretary-Treasurer, respectively, have been employed in the manufacturing, construction and sales departments of the electrical trade in Canada for the past 15 years. The office of the new company has been opened at the Street Railway chambers, Place d'Armes Hill, Montreal, Que.

OBITUARY NOTICES.

Charles Drinkwater, Secretary and Assistant to the President of the Canadian Pacific, died at Montreal, on April 23, of pneumonia. Mr. Drinkwater was born November 17, 1843, at Ashton, Lancashire, England. He entered railroad service in 1859 on the Manchester, Sheffield & Lincolnshire in England, and was for three years in the service of the Great Northern at London. He then went to Canada and from 1864 to 1874 he was private secretary to Sir John A. MacDonald, then Prime Minister of Canada. From 1874 to 1881 he was Chief Assistant to the Managing Director of the Grand Trunk. Since 1881 he has been Secretary of the Canadian Pacific and since 1900 also Assistant to the President.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Franklin Institute.

At a section meeting of the Institute there was an address on "Recent Work in Metallography," by Dr. William Campbell, of School of Mines, Columbia University, New York.

American Society of Mechanical Engineers.

The next meeting of this society is to be held May 12 in the Engineering Societies building, New York. At this meeting a paper on "Clutches," with special reference to the types used on automobiles, by Henry Souther, Hartford, Conn., will be read. Their development will be shown by lantern slides. The meeting will be important also to those interested in the use of clutches for machine tool work, power transmission, hoisting machinery, textile and other classes of machinery, and will afford an opportunity for the full

discussion of their design and use. The discussion will be continued at the semi-annual meeting of the society at Detroit, June 23-26.

Central Railway Club.

The next regular meeting of this club is to be held at the Lafayette Hotel, Buffalo, N. Y., May 8. At this meeting a paper on the "Possibilities of High Speed Tool Steel; a Review of Recorded Tests, H.P. Requirements, etc.," by L. R. Pomeroy, of the Safety Car Heating & Lighting Company, will be presented.

Engineers' Club of Philadelphia.

At a business meeting of this club to be held May 2 a paper on "Construction Methods on the Market Street Subway," by S. M. Swaab, illustrated by lantern slides, will be presented.

At a business meeting of the junior section to be held May 11, a paper on "Experience in Operating a Diesel Engine," by John S. Haug, will be presented.

Railway Signal Association.

The May meeting of this association will be held at 29 West 39th street, New York City, on Tuesday the 12th, beginning at 10 a.m. The subject in the forenoon will be the Specifications for electric interlocking, beginning at paragraph No. 80, page 27, of advance notice No. 5, issued last year. In the afternoon there will be a paper on storage batteries, by H. M. Beck. Mr. Beck discusses the restoration of low cells. The Secretary announces that as Mr. Beck treats his subject with reference especially to a single type of storage battery, it is desirable that makers of other storage batteries which are used for signal purposes shall be represented at the meeting, with a view to bringing out the best methods of dealing with all kinds of storage batteries which may need restoration. It is expected that at the afternoon session there will also be preliminary reports from some of the committees.

Iron and Steel Institute.

The annual meeting of the Institute is to be held at the Institution of Civil Engineers, London, Eng., May 14 and 15. The Bessemer Gold Medal for 1908 will be presented to Benjamin Talbot. The annual dinner will take place at the Hotel Cecil on Thursday. Among the papers to be submitted at the meeting are the following:

Experimental Electric Furnace for the Smelting of Iron, by Professor B. Igewsky.

Improvements in Plate Rolling Mills, by A. Lemberston.

Application of Color Photography to Metallography, by E. F. Law.

Utilization of Blast-Furnace Slag for Portland Cement, by C. von Schwarz.

New Fatigue Test for Iron and Steel, by T. E. Stanton, D.Sc.

Physical Qualities of Steel in Relation to its Mechanical Treatment, by James E. York.

Reports on research work carried out during the past year are to be submitted by C. A. Edwards, J. A. N. Friend (Germany), D. M. Levy, A. M. Portevin (France), A. K. F. Hiorth (Norway), B. Saklatwalla (India), E. Hess, C. Benedicks (Sweden), and H. C. Boynton, Carnegie research scholars.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

National Lines of Mexico.—J. E. Dennison, Auditor, has been appointed General Auditor.

Union Pacific.—M. H. Loomis, General Solicitor for Kansas and Missouri, has been appointed General Solicitor of the company, with headquarters in Omaha, Neb., succeeding J. M. Baldwin, deceased.

Operating Officers.

Kalamazoo, Lake Shore & Chicago.—H. D. Swayze, Traffic Manager, has been appointed General Superintendent, with headquarters at South Haven, Mich., succeeding James Grant, assigned to other duties.

Mexican Railway.—W. Cockfield, Locomotive Superintendent, has resigned to go to the Peruvian Southern as Locomotive Superintendent.

Missouri Pacific.—See St. Louis & San Francisco.

New York, New Haven & Hartford.—William R. Martin, Superintendent of the Boston division, has been made also Superintendent of the South Station, Boston, Mass.

St. Louis & San Francisco.—H. H. Brown, Superintendent of the

Ozark division, with office at Memphis, Tenn., has been appointed Superintendent of the Eastern division, with office at Springfield, Mo., succeeding A. O'Hara, resigned. J. F. Simms, Superintendent of the Missouri Pacific at Osawatimie, Kan., succeeds Mr. Brown.

Saratoga & Encampment.—B. F. Dunn, Superintendent, has resigned and Frank J. Cramer, Chief Engineer, succeeds Mr. Dunn.

Traffic Officers.

El Paso & Southwestern.—Charles McD. Adams, formerly General Agent of the Missouri Pacific at Memphis, Tenn., has been appointed General Agent of the El Paso & Southwestern at St. Louis, Mo.

Grand Trunk.—See Grand Trunk Pacific.

Grand Trunk Pacific.—J. E. Dalrymple, General Freight Agent of the Grand Trunk, has been appointed Freight Traffic Manager of the Grand Trunk Pacific, with office at Winnipeg, Man.

Kalamazoo, Lake Shore & Chicago.—See this company under Operating Officers.

Missouri Pacific.—W. H. Reid, commercial agent of the Mobile & Ohio at New Orleans, has been appointed General Agent of the Missouri Pacific at New Orleans, La. This office had been temporarily closed.

St. Joseph & Grand Island.—H. W. Prickett, Traffic Manager of the Kansas City stock yards, has been appointed to the new office of General Agent at Salt Lake City, Utah.

Engineering and Rolling Stock Officers.

Erie.—George H. Burgess, Engineer of Terminal Improvements at Jersey City, has been appointed Principal Assistant Engineer, with office in New York. The office of Engineer of Terminal Improvements has been abolished.

Tehuantepec National.—D. Coe, Chief Engineer, having been given leave of absence, Ernest H. Mitchell, as recently noted in this column, is Acting Chief Engineer.

LOCOMOTIVE BUILDING.

The Lehigh & New England has ordered three consolidation locomotives from the Baldwin Locomotive Works.

The Delaware, Lackawanna & Western is said to have ordered 17 locomotives from the American Locomotive Co. This item is not yet confirmed.

The Chicago, Milwaukee & St. Paul will build 70 Prairie locomotives at its Milwaukee shops, and is said to have ordered 50 engines from the American Locomotive Co. The latter item is not yet confirmed.

The Lehigh Coal & Navigation Co. has ordered two consolidation locomotives from the Baldwin Locomotive Works, for June delivery. The specifications are as follows:

Type of locomotive.....	Consolidation
Cylinders.....	22 in. x 28 in.
Diameter of drivers.....	56 in.
Boller, type.....	Straight
" steam pressure.....	200 lbs.
" tubes, number.....	300
" diameter.....	2 in.
" length.....	12 ft. 1/2 "
Firebox, length.....	126 1/16 "
Firebox, width.....	108 3/8 "
Heating surface, tubes.....	1,880 sq. ft.
" firebox.....	188 "
" total.....	2,138 "
Grate area.....	95 "
Tender.....	Steel underframe
Water capacity.....	6,000 gals.
Coal capacity.....	12 tons

CAR BUILDING.

The Union Traction Co., Santa Cruz, Cal., is said to have ordered four double-truck motor cars and two trailers. This item is not yet confirmed.

The St. Louis, Brownsville & Mexico is said to have ordered 30 Rodger ballast cars of 80,000 lbs. capacity from the American Car & Foundry Co. This item is not yet confirmed.

The Chicago Railways cars, mentioned in the *Railroad Gazette* of March 27, will be equipped with trucks built by the Pullman Co., and air-brakes furnished by the National Air-Brake Co.

The Grand Trunk Pacific, it is said, has ordered 18 first class coaches, 10 second class coaches, six combination baggage and smoking cars, and six mail and express cars, from the Canada Car Co., and 12 baggage cars from Rhodes, Curry & Co. This item is not yet confirmed.

The Lehigh & New England, as mentioned in the *Railroad Gazette* of April 3 and April 24, has ordered 300 all-steel 40-ton gondolas, weighing 34,000 lbs., from the Cambria Steel Co., and 250

steel underframe 30-ton box cars, weighing 34,000 lbs., from the American Car & Foundry Co., both for June-July delivery. The gondolas will measure, inside, 36 ft. long, 9 ft. 3 in. wide and 4 ft. 2 1/4 in. high, and over all, 37 ft. long and 7 ft. 7 1/2 in. high. The box cars will measure, inside, 36 ft. long, 8 ft. 6 in. wide and 7 ft. 9 1/4 in. high. The over-all measurements will be 37 ft. 1/2 in. long, 9 ft. 3 1/4 in. wide and 13 ft. 7 in. high to top of staff. The special equipment includes:

Bolsters, truck	Gould
Brakes	Westinghouse
Brake-beams	Davis Solid Truss
Brake-shoes	Steel back
Couplers	Gould
Door fastenings (box cars)	Security
Draft gear	Sessions-Standard
Journal boxes	Gould
Paint (gondolas)	Protectus
Paint (box cars)	Patterson-Sargent "Nobrac" and liquid brown
Roofs (box cars)	Chicago Improved Winslow
Springs	Lehigh Valley Spring Co.
Trucks	Arch bar

RAILROAD STRUCTURES.

EAST SOMERVILLE, MASS.—The Boston & Maine roundhouse, with nine locomotives, was recently destroyed by fire.

HOUGHTON, MICH.—The Duluth, South Shore & Atlantic, it is said, will put up a concrete roundhouse in its yards here, to replace one destroyed by fire.

LANCASTER, PA.—The Conestoga Traction has plans made for putting up car repair shops.

MEXICO CITY, MEX.—The new bridges on the National Lines of Mexico include the following: Three span, deck girder bridge to replace a trestle; a five-span, similar type bridge recently finished over the Nazas river, at Los Herreras, also an eight-span bridge over the Sabinas river, near Sabinas. Work is under way on a five-span bridge at Rio Escondida, near Fuente. Contract for the last two let to the Torreón Construction Co., of Torreón, Coahuila. These bridges are to replace the Phoenix column trusses which are now too light for the traffic.

NEW YORK, N. Y.—The New York Central & Hudson River will shortly give a contract for the second of its new terminal buildings at the Forty-second street station. The building for which the new contract is to be given will be the first part of the terminal proper to be built and will constitute about one-fourth of the whole. It will adjoin the new building on Lexington avenue, used for offices, which is now nearly finished.

NORFOLK, VA.—F. S. Gannon, President of the Norfolk & Southern, it is said, has made an announcement that the land recently bought adjoining the present river terminus is to be used as a site for large freight terminals, and for the erection of a general office building. The work is to be started as soon as the general financial conditions improve.

POTTSVILLE, PA.—The Pottsville Union Traction Company, it is said, will at once put up a bridge over the Philadelphia & Reading tracks at Mauch Chunk street.

PRESIDIO DEL NORTE, MEXICO.—Contract, it is said, will shortly be let by the Kansas City, Mexico & Orient to build a bridge over the Rio Grande at the proposed crossing near this place.

READING, PA.—An ordinance is to be introduced to provide money for the erection of a bridge over the Lebanon Valley tracks of the Philadelphia & Reading, at Tulpehocken street.

SAN DIEGO, CAL.—The San Diego & Arizona, it is said, is planning to put up shops, also a roundhouse at a cost of \$500,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALTON, ST. LOUIS & CAIRO (ELECTRIC).—Incorporated in Illinois with \$100,000 capital to build a line from Alton, Ill., south through Madison, St. Clair, Monroe, Randolph, Jackson and Union counties, to Cairo, in Alexander county, 130 miles. A branch is also to be built from the main line, west to Waterloo and Columbia, in Monroe county. The incorporators include T. N. Chase, J. F. Albrecht, D. W. Young, F. E. Orvis, W. L. Ensel and W. R. Brown.

ATLANTA, BIRMINGHAM & ATLANTIC.—Announcement is reported made that all the work is finished on the branch from the main line at Manchester, Ga., northwest to Atlanta, 71 miles, and that the line is now open for business.

BROWNSVILLE, MASONTOWN & SMITHFIELD STREET RAILWAY (ELECTRIC).—This company, organized to build 15 miles of line in Pennsylvania, has new plans ready for building 120 miles of electric lines in Fayette, Greene and Washington counties, Pa., and eventually into West Virginia. The company has a capital of \$3,500,000, and its office is at Masontown. Work has been started on the section from Brownsville south to Masontown. The lines are even-

tually to connect Masontown, East Millsboro, Gates, Lambert, Edenborn, Ronco, New Geneva, Point Marion, Smithfield, Republic, Martin, Zollarsville, Clarksville, Beallsville and Bentleyville. Connections are to be made with lines entering Pittsburgh. W. J. Sheldon President, McKeesport.

CANADIAN NORTHERN.—This company, it is said, has notified Hon. Robert Rogers, Minister of Public Works for Manitoba, that the following lines will be built this year: Adelpha, Man., west, 10 miles; from a point north of Virden, Man., crossing the Canadian Pacific, 10 miles; from a point on the Rossburn branch through Rapid City, Man., to the Viola Dale district, 25 miles.

CHICAGO, MILWAUKEE & ST. PAUL.—The Milwaukee Terminal Railway Company, it is said, was recently incorporated in the state of Washington in the interest of the Chicago, Milwaukee & St. Paul. The incorporators include H. R. Williams and E. W. Cook, Seattle, and A. H. Barker.

GRAND TRUNK PACIFIC.—A. L. McHugh has been given a sub-contract, on four miles through rock, by Foley, Welch & Stewart. J. E. Craig, August Stewart and Dixon & Moore also have contracts near this section clearing the right of way.

HARRISVILLE & CORNWALLIS.—An officer writes that bids are to be asked for about May 1 to build a line from Cornwallis, W. Va., on the B. & O., southeast, six miles, to Harrisville. The work includes two steel bridges. W. S. Stout, President, and A. Wolverton, Chief Engineer, Harrisville, W. Va. (April 17, p. 559.)

HUDSON BAY PACIFIC.—This company, organized last year with a capital of \$3,000,000, has recently been incorporated under an act of the British Columbia legislature. The company proposes to build a line from near Port Simpson, B. C., on the Pacific coast east along the Skeena river to Hazelton, thence via the head of Babine lake to the north end of Stuart lake; thence north of McLeod lake via Pine River Pass, along the Pine river; thence to Moberly lake and along Peace river valley to the eastern boundary of British Columbia. The articles provide also for building branch lines not over 20 miles long. The provincial directors include D. B. May, of Seattle, Wash.; J. McLachlan, Los Angeles, Cal.; L. A. Benson, Goldfield, Nev.; N. H. Harding, Jr., and W. H. Duval, New York.

INTERBOROUGH RAPID TRANSIT, NEW YORK CITY.—Announcement is made that this company expects to begin operating, May 1, the extension of its subway from Borough Hall, Brooklyn, to Atlantic avenue, .89 mile. At this point connection is to be made with the Long Island Railroad.

KANSAS CITY, MEXICO & ORIENT.—The extension of this road, north from Chihuahua, Mex., is making good progress and is expected to be finished to the Rio Grande this fall. Work is now under way down the valley of the Conchos river. On the line from the north there remains about 300 miles yet to be built to reach the Rio Grande. The gap of 90 miles between Alpine on the Southern Pacific, and the Rio Grande crossing is to be built within one year. A large tract of land, it is said, has been secured by the company near the site of the proposed International bridge, at which point a town is to be established.

KENTUCKY & OHIO RIVER (ELECTRIC).—The Royal Investment Company, Globe Building, Minneapolis, Minn., is to have entire charge of building this projected line from Paducah, Ky., west to Cairo, Ill. Contracts are to be let at once. The work will include 18 small bridges. Nort Whitesides, President. Wm. C. Langdon & Co., of Minneapolis, Minn., may be addressed. (April 10, p. 525.)

MEXICAN INTERNATIONAL.—Contract has been given to Bartola Corrigan, of Sabinas, Coahuila, and work is under way on a short branch line about 2 1/2 miles long from the Rosita branch at kilo 10, to the Cloete Coal Mines Works.

MILWAUKEE TERMINAL RAILWAY.—See Chicago, Milwaukee & St. Paul.

OREGON ELECTRIC.—This company, which has finished about 50 miles of line from Portland, Ore., via Tualatin and Wilsonville to Salem, except the ballasting, recently increased its capital stock from \$2,000,000 to \$10,000,000. On April 23 construction work was started on 283 miles of extension branches, and laterals, to the Portland-Seattle Electric line recently put in operation. Plans include lines as follows: Portland to Tillamook, Portland to Eugene, Salem to Mill City, Salem to Dallas, Salem to Albany, and Albany to Cascadia. Charles M. Pratt, of New York, is President; N. Talbert, Manager, Portland, and Moffat & White, of New York, are the bankers.

ROCHESTER, CORNING & ELMIRA TRACTION.—This company, organized to build an electric line from Rochester, southwest to Elmira, 120 miles, is making surveys over a new route, it is said. This will necessitate securing a certificate of necessity from the New York State Public Service Commission, and as soon as this is granted it is promised that construction work will be started. W. C. Gray and S. Fuerstein, 20 Exchange street, Rochester, N. Y.,

Engineers; F. S. Breckingham, 42 Broadway, New York, is a director.

ROCKPORT, LANGDON & NORTHERN.—This company, operating a road from Langdon, Mo., northeast to Rockport, 5.6 miles, expects to build an extension from Rockport north to Shenandoah, Iowa, about 30 miles. The W. K. Palmer Company, Engineers, 717 Dwight Building, Kansas City, Mo., who will have charge of the engineering work and supervise the construction, want to hear from contractors.

ROME & OSCEOLA.—Incorporated in New York with \$500,000 capital to build a line, to be operated either by steam or electricity, from Rome, Oneida county, N. Y., north to Osceola, Lewis county, 25 miles. Incorporators include J. H. Haselton, Rome, N. Y.; W. P. White and W. I. Taber, Utica, N. Y. (April 3, p. 493.)

RUSTON, NATCHITOCHES & NORTHEASTERN.—An officer writes that the route of this proposed line is from Farmerville, La., southwest via D'Arbonne, Ruston, Saline, Natchitoches and Leesville to the Texas state line, thence through Texas to a point at tidewater not yet determined upon, probably at Port Arthur, about 260 miles. J. C. Nolan, President, and J. Wesley Hall, Chief Engineer, Ruston, La. (March 27, p. 462.)

SPOKANE, PORTLAND & SEATTLE.—On the extension building from Pasco, Wash., northeast to Spokane, work has been suspended from Spokane southwest to Cheney, awaiting settlement of the question whether a satisfactory franchise to enter the city of Spokane will be granted. No new contracts will be let until the franchise is granted.

STUBENVILLE & EAST LIVERPOOL (ELECTRIC).—This company, operating 19 miles of electric line from Steubenville, Ohio, north to Toronto, recently put at work a large force of men to finish the double-track line on which work was started in the summer of 1907 and suspended last fall. This line is from Toronto, north via Wellsville, and East Liverpool, and thence east to Vanport, Pa., about 40 miles from Steubenville.

VANCOUVER ISLAND & EASTERN.—This company, organized last year with a capital of \$2,000,000, is seeking incorporation from the Dominion parliament. The company proposes to build a line from Esquimalt harbor, Vancouver Island, B. C., north to Seymour's Narrows; and from Bute inlet or Frederick inlet on the mainland of British Columbia, east via Yellowhead Pass to Edmonton, Alb., about 900 miles. The provisional directors include T. W. Paterson, T. J. Jones, R. C. Lowe and H. A. Munn, Victoria, B. C.; James Smith, Edmonton, Alb., and M. J. Harvey, Toronto. (Nov. 1, p. 542.)

WASHINGTON ROADS (ELECTRIC).—A. M. Dewey, of Spokane, Wash., with the co-operation of English capitalists, is to finance a line to be built in the northern part of the state of Washington into the Okanogan country. In this section there are a large number of copper mines, 26 having recently been located, and a number of smelters are to be built as soon as the proposed line is assured.

WESTERN PACIFIC.—Track on this line, it is said, is now laid from Stockton, Cal., to a considerable distance north of Sacramento, and it is expected to have trains in operation from Oakland to Oroville this fall. On the section above Oroville the work is very heavy. On 35 miles along the Feather river, about 1,200 men are at work. They recently finished 10 tunnels, each from 200 to 1,200 ft. long, and are now at work on 16 others. The line from this section runs through almost solid rock and it will cost to build through this section about \$100,000 a mile. Track is laid from Oroville to Big Bend, 17 miles, and three miles additional will shortly be finished.

RAILROAD CORPORATION NEWS.

BUFFALO, ROCHESTER & PITTSBURGH.—Gross earnings for the third week in April, 1908, were \$102,000, a decrease of \$64,000 from the corresponding week in April, 1907.

BOSTON & ALBANY.—N. W. Harris & Co. and Bond & Goodwin, both of New York, have sold \$3,500,000 25-year 4 per cent. bonds of May 1, 1908-1933, at 98.45, yielding 4.10 per cent. These bonds are guaranteed by the New York Central & Hudson River. The Boston & Albany has no mortgage indebtedness, its total bonded debt being \$15,485,000, against which it has in its treasury a New York Central 3½ per cent. bond of 1900-2000 for \$5,500,000.

CANADIAN PACIFIC.—During the six months ended December 31, 1907, the Minneapolis, St. Paul & Sault Ste. Marie bought \$1,601,600 stocks and bonds of other corporations. Nearly all of these are of the Spokane International, which gives the Canadian Pacific entrance into Spokane. This is a small road, which Sir Thomas Shaughnessy, President of the Canadian Pacific, says earned in its first year of operation, sufficient to pay expenses and fixed charges.

CHESAPEAKE & OHIO.—This company has sold to J. P. Morgan & Co., Kuhn, Loeb & Co. and Blair & Co. \$2,013,354 consolidated mortgage 5 per cent. bonds of 1889-1939, to meet an equal amount of 6 per cent. first mortgage bonds, series A and B, maturing July 1, 1908. The Chesapeake & Ohio has also sold to the same bankers \$1,500,000 of an authorized issue of \$2,500,000 6 per cent. notes to retire the \$1,200,000 extended notes maturing June 28, 1908, and to get \$300,000 new funds.

CHESAPEAKE WESTERN.—All the stock and bonds of this company were sold on April 22 to W. E. D. Stokes, of New York City, for \$25,000. All these securities were hypothecated to secure a loan. The company owns or leases 41 miles of line.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—Preferred and common stockholders are offered the opportunity to subscribe at par for all or such part of the \$1,000,000 preferred 5 per cent. stock as the board of directors shall determine to issue. The board of directors are to meet on or before June 1. Present holders of both common and preferred stock will have equal rights in subscribing to the new issue.

INTERBOROUGH RAPID TRANSIT.—J. P. Morgan & Co. have offered at par \$25,000,000 three-year convertible 6 per cent. notes of May 1, 1908-1911. These notes are convertible for 2½ years into the new mortgage bonds of the company at 99. The notes are secured by a deposit of \$30,000,000 new 45-year 5 per cent. mortgage bonds.

IOWA CENTRAL.—E. H. Rollins & Sons, of Boston and Chicago, have offered \$750,000 first and refunding mortgage 4 per cent. bonds of 1901-1951. These bonds are part of a total of \$25,000,000 authorized, of which about \$3,320,000 are outstanding and \$7,650,000 reserved to retire an equal amount of 5 per cent. bonds due 1938.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—See Canadian Pacific.

MISSOURI, OKLAHOMA & GULF.—W. H. Trumbull & Co., of Boston, and the Banque Franco-Americaine, of Paris, France, have offered the Missouri, Oklahoma & Gulf's outstanding \$2,500,000 5 per cent. first mortgage bonds of 1908-1944. The bonds are a first mortgage on the road at the rate of \$25,000 per mile, comprising at the present time 95 miles. The road runs from Wagoner, Okla., to Rose, on the Canadian river, traversing the Henryetta and Lehigh coal fields.

MISSOURI PACIFIC.—A large amount of the Missouri Pacific two-year 6 per cent. convertible notes, secured by \$12,000,000 Kansas & Colorado Pacific first refunding mortgage 30-year 6 per cent. bonds of 1908-1938, have been converted into these bonds. These notes were issued in January, 1908.

NEW YORK CENTRAL & HUDSON RIVER.—See Boston & Albany.

NEW YORK, NEW HAVEN & HARTFORD.—The Boston Chamber of Commerce has voted decisively to "firmly oppose the proposed control of the Boston & Maine by the New York, New Haven & Hartford." Some of the reasons given in this resolution are that it would place under one control a high percentage of the entire transportation facilities of the New England states, both steam railroads and trolley lines, and because such a consolidation would eliminate all competition, and, also because the Chamber of Commerce is strongly in favor of the Boston & Maine financing its improvements by an issue of its own securities.

The company has sold to Kidder, Peabody & Co., of Boston, \$9,000,000 first mortgage bonds of constituent companies. These bonds have been held in the treasury. In addition, the company has sold about \$2,000,000 short term notes to Kidder, Peabody & Co. Proceeds from the sale of these securities will provide upwards of \$11,000,000 to meet an equal amount of notes and bonds which mature between now and January 1, 1910.

NORFOLK & WESTERN.—A semi-annual dividend of 2 per cent. has been declared on the common stock. This is a reduction of the annual rate from 5 per cent. to 4 per cent.

The Guaranty Trust Co. of New York has sold \$7,500,000 two-year 5 per cent. notes of May 1, 1908-1910. These notes are secured by \$10,000,000 divisional first lien and general mortgage 4 per cent. bonds of 1904-1944. The notes were offered at 99, yielding 5½ per cent.

SEABOARD AIR LINE.—The receivers were authorized on April 18 to issue \$3,564,000 six per cent. receivers' certificates, dated May 1, and redeemable after six months.

SPOKANE INTERNATIONAL.—See Canadian Pacific.

WATERLOO, CEDAR FALLS & NORTHERN.—This company has made a mortgage securing \$2,000,000 five per cent. bonds for extensions. The road runs from Cedar Falls, Iowa, via Waterloo and Waverly to Sumner, 52 miles. It also operates street car service at Waterloo and Cedar Falls.